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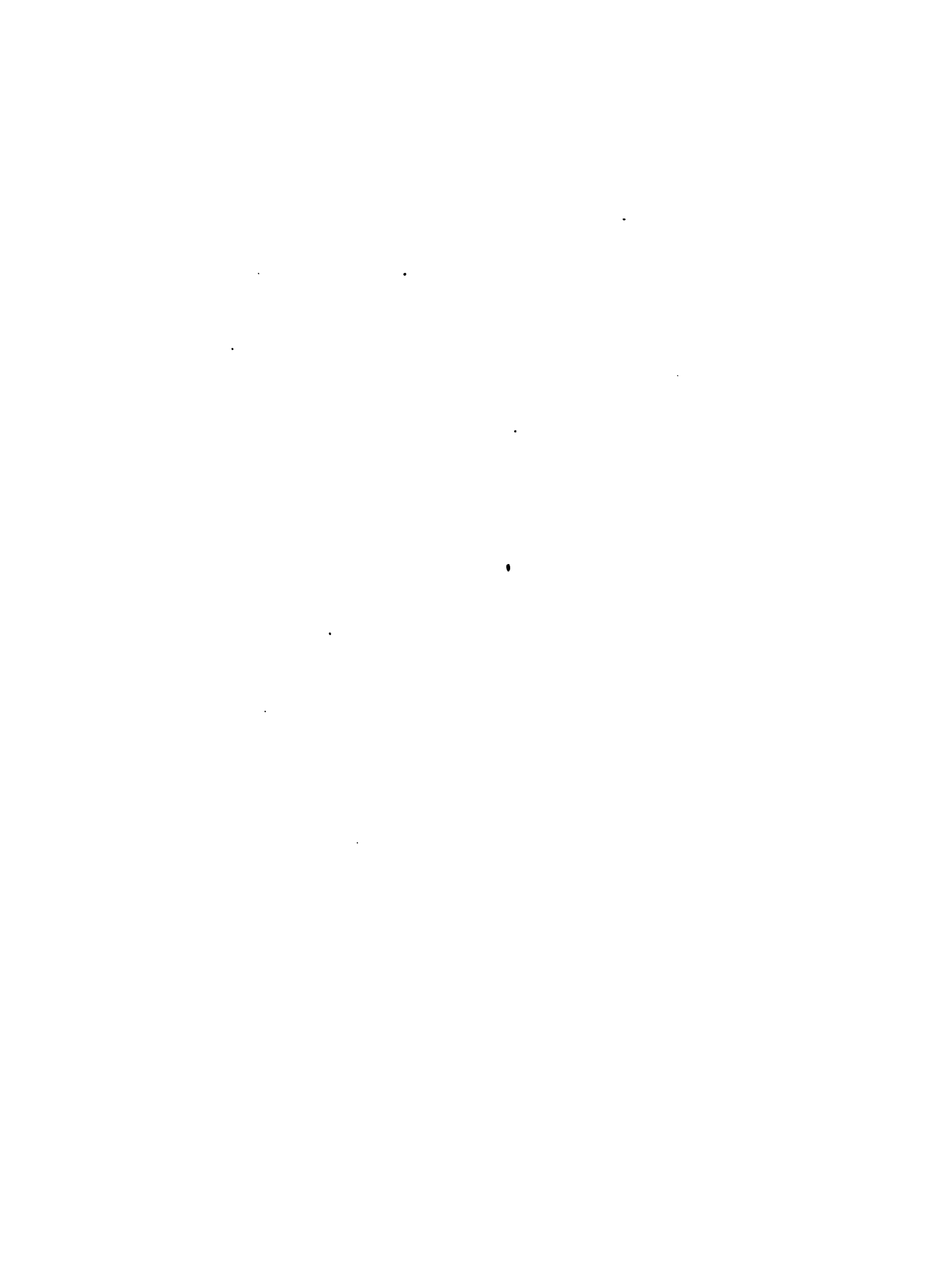
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GYNECOLOGY

MEDICAL AND SURGICAL

OUTLINES FOR

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BY

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WITH THREE HUNDRED AND FORTY-THREE ILLUSTRATIONS



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PREFACE

THIS book is particularly written for students in medical colleges and such general practitioners who desire to make themselves acquainted with the essentials of modern gynecology. It is an outline of the whole system of gynecology, calculated to be a guide for beginners. Minor operations, which the general practitioner is likely to undertake, are described in detail. In regard to others the chief features are set forth.

Those readers who seek information about anatomy, embryology, rare diseases, or unusual operations, are referred to my larger work, "A Text-book of Diseases of Women," third edition, 1900.

Conditions connected with pregnancy and childbirth are elucidated in my "Text-book of the Science and Art of Obstetrics" (LIPPINCOTT, 1902).

NEW YORK, 1905.

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GYNECOLOGY

GENERAL DIVISION

THE word Gynecology is derived from the Greek words *γυνή*, woman, and *λόγος*, understanding, and means the science that has for its object the diseases peculiar to women. It excludes, however, conditions connected with pregnancy, childbirth, and the puerperal state, which are described in Obstetrics. In its strictest sense it is the science of the morbid affections of the female genital tract outside of gestation, labor, and its immediate consequences. But since these conditions are a frequent cause of the disturbances treated by the gynecologist, and since, on the other hand, obstetric cases nowadays often are treated by methods belonging to gynecology, some overlapping of these two branches of medical science is unavoidable. The genital canal is anatomically in such immediate contiguity with the lower urinary organs and the rectum, and the treatment of diseases in these organs in woman assumes such peculiar characters, that it has become the custom also to consider them in works on gynecology. Thus the non-puerperal affections of all the pelvic organs constitute the legitimate domain of gynecology.

There is an intimate physiological connection between the genitals and the breasts, but the latter are in woman situated so far from the former that the patients suffering from diseases in them rather find their way to the general surgeon than to the gynecologist.

The word gynecology is, unfortunately, pronounced in no less than four different ways in English,—the first part being pronounced *gi'ne*, *gin'e*, *ji'ne*, or *jin'e*. But the dictionaries, which ought to be our guides in a question of this nature, recognize only the pronunciation *jin-e-kol'o-ji*.

CHAPTER I

PUBERTY AND CLIMACTERIC

WOMAN can conceive only during a certain period of her life, which extends over about thirty-five years,—from the age of fifteen to fifty years. At the beginning and at the end of this term there are times of transition which are called respectively puberty and the climacteric.

§ 1. Puberty is the transition from childhood to womanhood. It is a gradual development, which generally, in the temperate zone, takes place in the fourteenth or fifteenth year of the girl's life. At that time the breasts become larger, the uterus increases in size, the hips become broader, and the contour of the whole body is rounded out by an increase of adipose tissue. The external genitals and the arm-pits, hitherto smooth, become covered with a growth of hair; every four weeks there is a bloody discharge from the uterus; and the two sexes, which hitherto rather shunned and often even despised each other, begin to feel a mutual attraction.

Although a woman may become impregnated when she reaches puberty, that means not that it is advisable that she should have sexual intercourse at that early age. It is evidently against the laws of nature that she should become a mother before her own body is fully developed. *Nubility* and puberty are different epochs in woman's life. As a rule, she should not marry before the end of her twentieth year.

§ 2. The climacteric, or menopause, popularly known as the change of life, marks the end of the fruitful period of woman's existence. Like puberty it comes on gradually and may even occupy two or three years. As a rule, it occurs between the ages of forty-five and fifty years. It comprises the time when menstruation becomes rarer and finally ceases.

The first symptom of the approaching menopause is irregularity in regard to time and amount of the discharge. The best way of cessation of catamenia is that the woman skips a period or two and that these intervals gradually become longer; but sometimes the monthly flow stops suddenly, particularly in consequence of disease, injury, exposure, or mental emotion; and then the patient is apt to suffer considerably. It is preferable that also the amount diminishes gradually; but often there arise, on the contrary, severe uterine hemorrhages at this period of life.

Most of the other symptoms which characterize the climacteric may be referred to active or passive hyperæmia of different organs. The patient has often a red face, headache, vertigo, indistinct vision, buzzing in the ears, or nosebleed. The stasis of blood in the abdomen causes gastro-intestinal catarrh, a torpid liver, icterus, and hemorrhoids. The hyperæmia of the lungs leads to bronchial catarrh and dyspnœa. That of the kidneys is revealed by a thick urine, forming a sediment at the bottom of the vessel in which it stands. A mucous discharge from the uterus and vagina often replaces the bloody. The patient complains of flashing heat and suffers often from itching of the skin or the vulva. Sometimes she has backache, neuralgia, palpitation, or tremor of the limbs; suffers from insomnia or dreams; and may become delirious or even insane. The sexual appetite is not rarely increased. The temper is subject to great and sudden changes. Most women become stout, but some lose flesh. Serious diseases, such as gout and carcinoma of the breast or uterus, may make their appearance. The uterus, the tubes, the ovaries, and the breasts become atrophic.

Treatment.—The bowels should be kept open with saline aperients or enemas. Cool or cold baths followed by thorough friction of the skin with Turkish towels produce a wholesome derivation to the skin. The urine is diluted by copious draughts of plain or mild saline water, such as Vichy, Rhens, Apollinaris, Seltzer, Waukesha, or Poland water, or by taking half a drachm of sodium bicarbonate in a tumblerful of water or lemonade. The congestion to the head may be relieved by hot foot-baths with or without mustard, or by letting a stream of cold water play on the closed eyes for five minutes three times a day. If this does not suffice, the occasional application of four leeches around the anus is indicated. A tepid bath tranquillizes the nerves. If the patient suffers from itching, it is well to add a handful of washing-soda and a handful of starch, boiled with a dishpanful of water. Insomnia should be treated with trional, sulphonal, phenalgin, or other hypnotics, and for disquieting dreams bromide of sodium is effective. The diet should be bland. Alcoholic drinks, coffee, and spices should be avoided. If there is a tendency to stoutness, the consumption of cereals and sugar should be restricted and milk and beer absolutely forbidden.

In order to avoid congestion of the internal genitals and possible hemorrhage, the woman had better abstain from sexual intercourse. When the menopause is established, marital relations may be resumed

with impunity. The physician may give much relief by combating unwarranted anxiety, and the patient can contribute to her own comfort by leading a quiet, healthy life, taking proper exercise, and occupying her mind usefully. If there is loss of blood from the genitals, a quantity corresponding to a normal menstruation should be allowed to flow, but after that, hemorrhage should be controlled or checked as taught later on. Palpitation requires the use of digitalis, cactina, adonidin, convallaria, monobromide of camphor, and other heart-tonics and sedatives.

CHAPTER II

ETIOLOGY IN GENERAL

THE causes of gynecic diseases may be divided into *predisposing* and *exciting*.

§ 1. *Predisposing Causes*.—*Heredity* may make itself felt in one of two ways: either the same disease of which one or both parents suffered appears in the offspring; or the daughter of sickly or diseased parents comes to the world burdened with a weak constitution, which renders her an easy prey to the multifarious aggressions of the elements or other morbid influences. Even advanced age of one or both parents at the time of the conception of the child places this at a disadvantage in the battle of life.

Education has a powerful influence on the whole life of woman. While instruction and training are necessary for the development of intellect and talents, too great a mental development is often bought at the expense of a strong nervous system and the normal performance of physical functions. It is unwise to overtask the brain by difficult studies at the time of puberty and the nearest following years, when the great change takes place in the uterus and the ovaries. It is better for a woman to have healthy pelvic organs than to be able to read Horace and Sophocles in the originals. To spend hours daily practising a page of music on the piano is directly injurious to the nervous system by the mechanical vibration it imparts to the fingertips and the acoustic nerve.

Hyperæmia of the pelvic organs brought on by masturbation or mental excitement of a sexual character frequently leads to disease. *Neglect of the skin* is hardly found among the well-to-do in America, but is exceedingly common among the poor, and nearly blocks the exits of effete matter through that immense emunctory. *Insufficient exercise and lack of open air* result in weak muscles, irritable nerves, and defective respiration, with the concomitant impoverishment of the blood. Wealthy women think it is sufficient to take a ride in a well-suspended carriage, while it would do them much more good to walk an hour. Bicycling,¹ tennis, golf, and similar open-air exercises are excellent.

¹ Garrigues, "Woman and the Bicycle," The Forum, January, 1896.

Many women have a poor appetite and do not take a sufficient amount of substantial *food*. Young girls often declare that they cannot eat anything in the morning, and rush off to school with an empty stomach. Often this lack of appetite can be traced to the immoderate consumption of candy, which with women plays a rôle similar to that of alcohol and tobacco in the other sex.

Women are very apt to neglect proper attention to *excretions*. They often go for days without a movement of the bowels, which leads to absorption of the gaseous and liquid part of the feces, dyspepsia, and anemia; and the accumulation in the lower part of the intestine drives the uterus out of place and causes stasis of the blood in the pelvic vessels. The retention of urine is still more injurious. Incontinence or lack of opportunity to empty the bladder frequently tempts women to combat the desire for doing so. Employers are often to be blamed for not providing proper accommodation for their female employees. This produces neuralgia, cystitis, and perhaps even paralysis or gangrene of the bladder. The frequent overfilling of this viscus leads also to retrodisplacements of the uterus.

The *dress* of women is open to much criticism. In order to be elegant they often are insufficiently clad. The *décolleté* evening dress exposes the throat and a large portion of the chest to refrigeration. The bell-shaped skirts admit cold air to the abdomen. This may be debarred by having close-fitting woollen underwear; but few women do so. The corset is particularly noxious. The times are no longer when women were laced by main force to produce a low, narrow waist, but the mere shape of the corset which places an outer skeleton of wire, bone and steel rods around their abdomens is to be deprecated. The erect-laced, the so-called "erect-form corset," abolishes the abdominal cavity by placing in front of it straight metal rods, which press all the abdominal organs up against the diaphragm and down on the internal organs. High heels used in the young age, when even the bones are not yet acquired their final degree of solidity, are apt not only to produce deformities, but cause neuralgia in the legs and change the inclination of the pelvis and the curvature of the back.

Exhaustion, which has become so common in city life, with social engagements, and the excitement of a time when people ordinarily go to bed, may exhaust the nervous system and may become a source of suffering. ~~Exhaustion~~ *Exhaustion* is a fruitful cause of gynecic disease. A woman who is exhausted need not stay in bed or in the house during her monthly period. She should abstain from exposure and violent exercise.

To go dancing or skating at this time should be absolutely interdicted.

Unnatural sexual relations are soon punished by disturbed functions or diseased organs. Interruption of coition, in order to prevent ejaculation into the female genitals and thereby impregnation, is a common practice, which excludes the normal orgasm; and the use of condoms, *coitus in vaso indebito*, even injection of water into the vagina immediately after copulation, cause congestion, inflammation, the formation of fibroids, hemorrhage, leucorrhœa, etc. *Marriage* of a woman with diseased and tender genitals, especially endometritis, oophoritis, not to speak of vaginismus, is followed by much physical and mental suffering. *Celibacy*, on the other hand, is often accompanied by the development of myomata. As we have seen above, the *climacteric* is frequently attended or followed by great disturbances in the whole economy.

§ 2. **Exciting Causes.**—*Faulty development* of the fetus produces malformations, which will be considered under the diseases of the special organs. *Coition during menstruation* may cause regurgitation of the blood into the peritoneal cavity.

Childbirth is one of the most common causes of the special diseases of women. Tears of the vaginal entrance or the cervix lay the foundation of displacements, chronic inflammation, and cancer. Lack of aseptic and antiseptic precautions results often in acute pelvic inflammation or peritonitis, with adhesions between the abdominal and pelvic organs, by which the patient becomes an invalid. Too early getting up is likely to produce antelexion of the uterus.¹

Abortion is a much more serious event than most women think. It offers the two immediate dangers of hemorrhage and septicæmia, which both are due to retention of parts of the ovum in the uterine cavity. Criminal abortion is still worse than the one which occurs spontaneously. The patients themselves introduce into their uterus knitting-pins or crochet-needles, which, as a rule, are not sterilized, although some smart women even make an attempt in this direction. Abortionists take often similar risks or let the patients come to their offices to have a tent inserted and then go home. Sometimes their clumsy manipulations cause such injury that even the intestine prolapses through a rent in the uterine wall. More remote effects of abortion are subinvolution or displacements.

¹ Garrigues, "Rest after Delivery," Amer. Jour. Obst., vol. xiii., No. iv., October, 1880, pp. 851-863.

Gynecological treatment may also produce gynecic diseases. Intra-uterine treatment, such as applications, the use of the uterine sound or tents, curettage, incision of the cervix, trachelorrhaphy, extirpation of polypi, formerly cost many lives, until gynecologists learned to use antiseptics and asepsis; and it still leads to disease or death, if these are neglected.

Gonorrhœa is, of all dangers that threaten women, one of the most serious. It is true, that if limited to the urethra and the vagina it is of little consequence to the patient, aside from the danger of imparting it to others, and it is more easily cured than in man; but if, in fortunately exceptional cases, it enters the uterus and extends to the tubes, ovaries and peritoneum, the result may be fatal or the infection may give rise to grave disease, followed by sterility and invalidism. Even many years after a man was infected and seemingly cured, there may lurk a minute quantity of pus behind a stricture in his urethra. Perhaps it does not contain gonococci, but shortly after marriage his wife is seized with a pelvic inflammation similar in symptoms and consequences to a gonorrhœa. This condition is known as *latent gonorrhœa*.

CHAPTER III

EXAMINATION IN GENERAL

THE examination is *verbal* or *physical*. Although much time may be saved by proceeding directly to the latter and asking necessary questions later, gynecology moves on such delicate ground, that, as a rule, the physician should first listen to the story the patient is anxious to tell and ask the chief questions before passing to the physical examination.

§ 1. **Verbal Examination.**—*Age.*—Although women, as is well known, are inclined to reduce somewhat the avowed number of their years, it is proper for the physician to ask the patient how old she is, since this information may be a help in diagnosis and contain a hint as to treatment.

Social Position and Pursuits.—For the right understanding of a complaint it is frequently necessary to know something about the patient's occupation, and her financial resources often are a deciding factor in the treatment to be recommended. In a general way it may be said that a quicker cure, even if more drastic measures are required for it, is preferable in those who must work for a living.

Duration of Sickness.—The length of time the patient has been sick informs the physician at once whether he has an acute or a chronic case before him.

Condition.—It is absolutely necessary to know whether she is single or married, or, without being married, has sexual intercourse or indulges in bad habits. While the first question should be addressed directly to her, it is advisable for the examiner in regard to the two others to find indications pointing in those directions before seeking confirmation by so delicate avowals. If the patient is married, the next question is how long.

Childbirth and Miscarriage.—Then we ask whether she has borne children, and, if so, how many. We inquire about the age of the oldest and the youngest child, as pregnancies and labor repeated with short intervals are often the cause of disease; and frequently the trouble for which we are consulted dates from the last childbirth. If the patient, although married, has remained sterile, it may be necessary to ascertain whether this is a natural condition or has been brought on by the

use of preventives. If genuine sterility is combined with dysmenorrhœa, it is frequently due to a displacement of the uterus, especially ante flexion, or narrowness of the cervical canal. If the woman has had many miscarriages, the doctor is unfortunately also placed in the unpleasant position of being obliged to ask whether any means were used to interrupt pregnancy. If nothing of that kind has been resorted to, the abortion may be due to diseases of the uterus, particularly ante flexion, endometritis, or myomas; or to syphilis in the patient, her husband, or both, any of which conditions call for special treatment.

Menstruation.—The normal time for the recurrence of menstruation is 28 days, and the flow lasts about 4 days. The amount of blood lost is said to be 5 ounces. Many women calculate their loss by the number of napkins used, and nearly every one can tell whether she loses much, little, or a normal quantity. A good standard to go by is the condition of the woman. If she becomes weak, she loses more than is desirable for her constitution. Normally menstruation is preceded by only a sensation of heaviness in the lumbar region. Pain is always a sign of disease. If it comes 8 or 10 days before the catamenia, it is probably of ovarian origin, while a pain accompanying the menses is probably due to some affection of the womb; if it is present only during the beginning of the flow, it is most frequently produced by a flexion, but if it continues during the whole period or even some days after, it arises probably from an inflammation of the uterus.

If the patient does not menstruate, the physician must take her age into consideration, as she may not have reached puberty or may have passed the climacteric. He must ask whether she has ever menstruated, and if so, whether this is the first time menstruation has been absent, or if she usually has irregular courses. If she has menstruated before, the physician should inquire whether the menses suddenly stopped during a period and if any unusual exposure to wet and cold had taken place. If the woman has reached the age of puberty and is well developed in regard to size, general appearance, and voice, he must ask whether she has a monthly recurrent cerebral congestion or pelvic pain and general malaise, so-called *molimen*, or a bloody discharge from other organs, with the character of *vicarious menstruation*. Under such circumstances a physical examination is imperatively indicated, in order to determine the presence and normal condition of the genitals and state of other organs involved. In every case of amenorrhœa the physician should bear in mind that it may be physiological,

—*i.e.*, that the patient may be pregnant. He should inquire about nausea and vomiting. If she is young, he should under pretext of sounding her lungs obtain an inspection of her breasts. If these show enlarged veins, a beginning secondary areola, or if a drop of fluid can be pressed out of the nipple, the way is clear for a demand to make a vaginal examination.

Married women who do not wish to have children sometimes seek the physician in order to be treated for amenorrhœa in the hope that he will do something that unintentionally may bring on abortion. On the other hand, sterile women who are anxious to become mothers may lose their menstruation for many months, may imagine that they feel fetal movements, and may develop an enlargement of the abdomen, much like that of pregnancy—so-called *phantom tumor*. Old women often believe that their menstruation after having been absent for a year or more has returned. Such an event is highly suspicious, since it nearly always is the first symptom of cancer of the uterus, and calls for a thorough digital and specular examination.

Discharge.—The physician should ask whether there is any discharge from the genitals between the periods, and if so, inquire what color, consistency, and odor it has. A white, milky discharge comes from the body of the uterus and is more amenable to treatment. A thick, glairy one is secreted by the cervix and is often hard to cure. A rust-colored one contains blood and is probably derived from ulcers or granulations. A yellow fluid contains pus and is due to an inflammation, often of gonorrhœic origin. An offensive odor suggests cancer, but may be found also in simple endometritis.

Pain.—Pain is present in most cases and is usually found in well-defined localities,—the left iliac fossa, the right iliac fossa, or both, the sacral or lumbar region, under the left breast, in the epigastrium, around the navel, the head, the anterior surface of the thigh (neuralgia of the anterior crural nerve), the external surface of the same (neuralgia of the external cutaneous nerve), in the coccygeal region, or the interior of the pelvis. When unilateral the pain is generally referred to the affected side, but exceptionally it is felt on the opposite. Most common of all is pain in the left iliac fossa, which probably finds its explanation in pressure from the rectum and in the absence of valves in the left ovarian vein and its débouchure at right angles into the left renal vein. As a rule, the pain is increased by walking and other muscular exertions. Frequently coition is painful, so-called *dyspareunia*. Sometimes the patient suffers from *itching*, either of the privates or of the whole

skin, or from a *burning* sensation in the abdomen. Others have a pricking pain in the eyes combined with weak eyesight (*asthenopia*).

Some complain of *palpitation*, and a few may be *hysterical*.

The *appetite* is generally poor. The women are usually *anæmic* and soon become *tired*. They are commonly *constipated*. They often complain of frequent and painful *micturition*, even without affection of the bladder. As a rule, they sleep well, but some complain of *insomnia* or *dreams*. The *family history* sometimes reveals an hereditary disposition, especially tuberculosis, cancer, or nervousness.

Special Questions.—In many cases other questions are necessary. If the patient has a tumor, it is important to ascertain when and where she first noticed it and what size it had. If the examination is unusually painful, it is proper to ask whether coition hurts and how often it takes place. If the genitals are insufficiently developed, it is natural to ask whether the patient feels normal sexual desire and satisfaction. In syphilitic cases it is of paramount importance to ask for the chief primary and secondary symptoms,—ulcers, swollen glands, cutaneous eruption, sore throat, and alopecia,—when they appeared, and how they were treated. In cases of gonorrhœa and chancroid, if acquired from the husband, the necessity of his seeking medical advice must be pointed out. To ask a woman point-blank whether she masturbates is rather rude and risky. The guilty one understands the physician perfectly well if he asks her whether she is bothered with heat in the

genitals, and whether she touches or scratches them. But all such special questions should be asked during or after the physical examination that naturally leads to them.

§ 2. Physical Examination.—

Most examinations can be made with the patient lying on her bed or on a couch, and in the home of the patient this is the common way. It is, however, necessary to prevent her from sinking down in the soft mattress of the bed or upholstering

of the sofa, which is done by placing a board under her nates. The lap-boards found in most houses answer very well. In hospitals, dispensaries, and offices tables made for the purpose are used (Fig. 1). The table should be placed near a window, the foot turned towards

FIG. 1.



Daggett's examination-table.

the light. Bladder and intestines should be emptied. The first may be attended to impromptu by means of a catheter, the latter must be evacuated beforehand by an aperient and a copious soap-suds enema. If the physician neglects these points he exposes himself to diagnostic errors which at once will deprive him of the patient's confidence.

I. POSITIONS.—To obtain a reliable result of the physical examination it is important to place the woman in certain positions. The most important are the dorsal and Sims's position; but in special cases the genupectoral, the elevated-pelvis, the erect, and the ventral positions offer certain advantages.

The Dorsal Position (Fig. 2).—The patient lies on her back, the knees bent and moderately separated, the heels placed in holes in

FIG. 2.



Dorsal position.

stirrups in front of the table. The patient is covered with a sheet reaching up to the breasts. The skirts are pushed up on the abdomen. For a complete examination the patient should remove her corset, and for that purpose there must either be a separate room or a screen behind which she can arrange her toilet. Specialists who receive many ladies keep a nurse to help them. For a common exploration of the pelvis it suffices that the patient has open drawers, or if they are closed that she slips off one side of them. The lower end of the sheet is folded in between the thighs, so as to leave only the vulva exposed, and if no inspection is intended she remains entirely covered. Some tables are so arranged that the feet are raised up by the side of uprights fastened to the table, near the foot.

The *breech-back position* is a modification of the dorsal position, in which the pelvis is raised about four inches above the level of the table. It is often needed, in order to concentrate the light on the os uteri.

Sims's Position (Fig. 3).—The patient lies on her left side, half-

FIG. 3.



Sims's position.

turned over on her front. The left side of her face rests on a cushion, the left breast touches the table, the left arm hangs down behind the body, the right is bent and the hand placed on the cushion, in front of

FIG. 4.



Genupectoral position. (H. F. Campbell.)

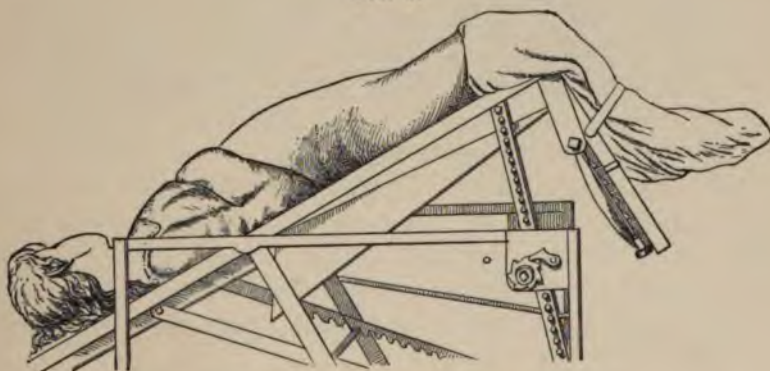
the face; the nates are made to slant downward and outward, the right half being a little nearer to the head than the left; the hip-, knee-, and ankle-joints are placed at about right angles, the right extremity a little higher towards the head than the left. In a first examination both the

dorsal and Sims's position should be used, since they supplement each other. The dorsal is best for the bimanual examination and for that of the abdomen; Sims's, on the other hand, allows one to insert the fingers fully two inches deeper behind the uterus, by which the appendages may be palpated much more completely. The anterior part of the pelvis is sometimes felt more distinctly in this position; an ante-flexion becomes, for instance, often much plainer when the corpus falls right over the examining finger. The chief advantage appears, however, when the position is used in connection with Sims's speculum.

The *genupectoral position* (Fig. 4) is rarely needed for diagnostic purposes, but is useful for replacing a retroflexed uterus or a prolapsed ovary or intestine. The patient rests on her knees, the upper part of the chest, the right side of her face, and her right forearm. The thighs should be perpendicular and the back hollow, as shown in the illustration.

The *Elevated-Pelvis Position* (Fig. 5).—The patient lies on her back on a more or less inclined plane, the head low and turned towards

FIG. 5.



The elevated-pelvis position.

the light and the pelvis raised. The legs are bent and tied to an extension forming a right angle with the table. This position is sometimes used for determining the relations between a tumor and the abdominal organs, but its greatest value appears in laparotomies, in which by its means the whole pelvic cavity can be made visible and accessible for treatment.

The *erect position* is useful in examining for prolapse. The phy-

sician sits on a chair, the patient stands in front of him, fully dressed, bending slightly forward, and the feet separated about half a yard. The examiner introduces his hand and arm under her skirts.

In the *ventral position* the patient lies stretched out on her front and one side of her face. It is chiefly used for percussing the lumbar region in examining for floating kidney.

Having placed the patient in the position required, we proceed to examine her.

II. EXAMINATION OF THE PELVIS.—The methods employed are *inspection*; *digital exploration* through the vagina, the rectum, or the bladder; *combined exploration*; *artificial prolapse of the uterus*; the use of *specula*, the *uterine sound*, or the *probe*; and *dilatation of the cervical canal*.

A. *Inspection* is performed with the patient in dorsal decubitus. Any deviation from the normal in regard to shape, size, or color is noted.

B. *Digital Exploration*.—The sense of touch may be much developed by practice, and the physician should accustom himself to use either hand, especially the index-fingers. This offers not only the advantage of enabling him to examine a patient without changing her position, but in certain cases a more satisfactory result is obtained by using the finger homonymous or heteronymous with the side of the pelvis to be explored, or both. As a rule, the left side is felt best with the left forefinger, and the right with the right.

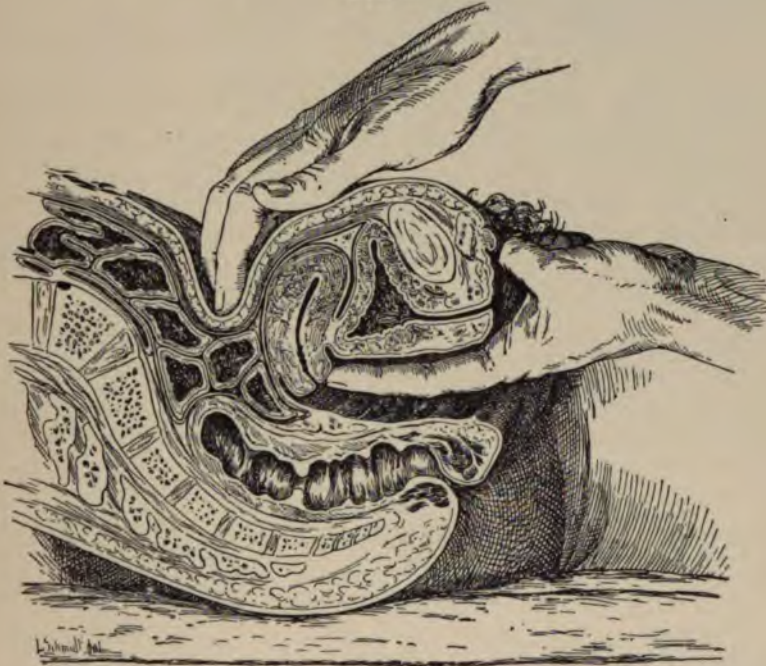
Cleanliness.—Before making a digital examination, the practitioner should wash his hands with soap and water before the eyes of the patient. His nails should have been cut short and cleaned with brush and steel scraper; but complete disinfection of the hands, which is imperative in labor cases and gynecological operations, is not required for a mere examination.

Lubricants.—To facilitate the introduction and movements of the finger in the different cavities, some slippery substance, such as oil, vaseline, lubrichondrin, or soap, should be smeared over it.

Vaginal Exploration.—Generally, only one index-finger is used; but if the vagina is large it is sometimes possible and advantageous to insert the index and the middle finger together, which, however, in most women is somewhat painful. If the vulva does not gape, it is spread open with the thumb and index of one hand, to make room for the index of the other. When this has entered, the four fingers of

the hand that hitherto opened the vulva, are placed on the hypogastric region and co-operate with the internal finger. This is called *bimanual examination* (Fig. 6).

FIG. 6.



Bimanual examination.

Bimanual Examination.—The exploring index is extended, the other fingers bent, and the thumb either extended in front of the mons Veneris or flexed and placed in apposition to the middle finger. In inserting the index the examiner should notice the condition of the perineum, the entrance to the vagina, and its walls, and place the tip of the finger on the os, the shape and position of which should be ascertained. He pays attention to the size, shape, and consistency of the cervix. By pressing on the fundus from the abdomen at the same time, he calculates the size of the uterus, tries its mobility, judges of its sensitiveness, and makes out its shape and position. Next, the finger is moved out to the lateral vault on both sides and the outer hand follows. By thus seizing the tissues between the two hands, the tubes and ovaries are palpated. Then the internal finger sweeps over the anterior fornix, and is finally carried as deep as possible behind the

uterus, by which manipulations, in lean women, the whole surface of the uterus may be gone over. In making his examination the doctor should observe the patient's face, the expression of which is often a valuable guide to the evaluation of the pain caused by the examination and a hint as to how far it is advisable to push it.

After the examination in the dorsal position, the patient may be turned over into Sims's, in which the exploration is done only with one hand. Some prefer to use the left index, but personally I find that I work better with the right. In the former case the examiner stands at the foot of the table, in the latter behind the patient.

Rectal Exploration.—The patient is placed in Sims's position. The doctor stands behind her and inserts the right index. In order not to soil it unnecessarily, it is well to fill the space under the nail by running it over a moistened cake of soap. The physician should pay attention to hemorrhoids, fissures, polypi, ulcers, and strictures, as well as to the genitals in front and the sacro-uterine ligaments on the sides. The finger reaches the so-called sphincter superior. Sometimes the uterine appendages are felt better from the rectum than through the vagina. In cases of pelvic or abdominal tumors much valuable information may be gained by a rectal examination. This is sometimes used in virgins in order to avoid injury to an intact hymen. But with care and patience an examination may be made through the vagina without tearing the hymen, which never ought to be done. In children the rectal examination combined with the abdominal allows one to explore nearly the whole abdomen; but, since it is very painful, they should be anesthetized.

Vesical Exploration.—The urethra can easily be dilated with a set of coniform dilators sufficiently to admit the index-finger. By introducing it into the bladder one can feel if there is any tumor or foreign body. The anterior surface of the uterus becomes accessible. Instruments may more readily be introduced into the ureters through a dilated urethra. In cases of closure of the vagina this manipulation may allow one to decide whether the patient has a uterus and ovaries. But sometimes the dilatation has been followed by irremediable incontinence, and the method should therefore be limited to cases in which the information sought is of great importance and cannot be obtained in any other way. Generally a catheter in the bladder, working together with a finger in the vagina, the rectum, or both, is sufficient for diagnostic purposes.

Combined Exploration.—Under certain circumstances it may be

advisable to combine several of the above-mentioned means of digital examination. Thus, the perineal body may often be palpated by introducing the index into the rectum and the thumb into the vagina. In other cases the index is inserted into the vagina and the middle finger into the intestine, while the four fingers of the other hand, press on the abdominal wall.

C. *Artificial Prolapse of the Uterus*.—The vaginal portion may be seized with a volsella and pulled down, while one or two fingers are inserted into the rectum. In this way the whole posterior surface of the uterus, the tubes, ovaries, broad ligaments, and the pedicle of an ovarian tumor may be palpated. But since sometimes the uterus is bound by adhesions and is immobile or the mechanical insult may set up perimetritic inflammation, this method of investigation should be rather restricted.

D. *Specula*.—Specula are instruments used for exposing the deeper parts of the canals leading from the perineum to the pelvis. Besides their diagnostic value they are indispensable in the performance of most operations in this region. We have *vaginal*, *cervical*, *uterine*, *rectal*, *urethral*, *vesical specula* and the *galvanic cystoscope*.

Vaginal Specula.—There are a great many of them, but they may be reduced to three types,—the *tubuliform*, the *plurivalve*, and the *uni-*

valve. Of the tubuliform specula Fergusson's (Fig. 7) is the best known. It is made of glass, covered with a layer of tin-foil, which is coated on the outside with black varnish. The proximal end has a flange which serves as a handle, a check

on too deep introduction, and a concentrator of light; and the distal end is bevelled. The patient is in the dorsal or Sims's position, the labia majora are separated with the left index and thumb, and the lubricated speculum introduced with the longest side turned against the perineum. During its progress the anterior and posterior walls are visible, separated by a transverse line, and finally the vaginal portion of the uterus with the os appears. This speculum gives excellent light; but it removes the uterus from the examiner; it does not expose the vault of the vagina; it flattens out the lips of a torn cervix and gives the erroneous impression that the inflamed cervical membrane is

FIG. 7.

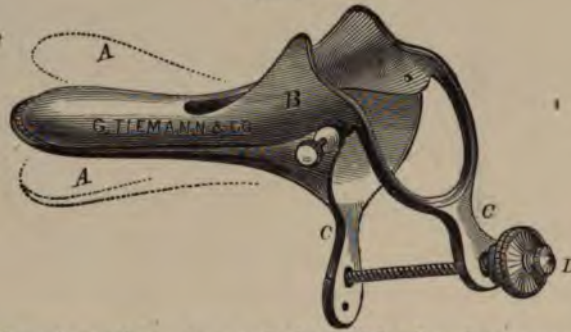


Fergusson's vaginal speculum.

converted into an ulcer; it does not allow the introduction of a sound or probe through it, unless one chooses a wide and short speculum, the passing of which causes pain; and finally, it is hard to clean.

Of *plurivalve specula* the bivalve is the most useful,—*e. g.*, Brewer's (Fig. 8), made of brass and nickel-plated. They may be used with the

FIG. 8.



Brewer's speculum. A, open; B, closed; C, handles; D, set-screw.

patient in the dorsal or Sims's position. Before inserting a plurivalve speculum the physician should by digital exploration ascertain the position of the os, and then introduce the instrument in that direction until it is arrested by the cervical portion, when the branches are separated by

pressing on the handles and moving the screw. The os is not always found immediately, but by moving the speculum in different directions and opening it more or less the orifice will soon be seen. When it is visible, the speculum is inserted a little deeper until it strikes the vault of the vagina. For virgins only a very small bi-

FIG. 9.



Sims's speculum.

valve speculum, four inches long and seven-eighths of an inch wide, should be used.

Sims's speculum (Fig. 9) is a *univalve* speculum, or single blade. It is made of nickel-plated brass, in ten sizes, each two combined in one instrument. No. 4 is the most generally useful for examination, and No. 5 for operations. The smallest size is destined for virgins. The

univalve speculum is the only one which shows the uterus and the anterior wall of the vagina in their real position, for all it does is to draw back the perineum and the posterior wall of the vagina. It alone allows the examiner to combine inspection and touch. It admits the sound or probe with ease, and it is indispensable for the performance of most gynecic operations. Sims's speculum is generally used with the patient in his position; but for certain operations she lies in the dorsal position; and then one or two single-valve specula are used, one to depress the posterior wall of the vagina, the other to elevate the anterior. When the patient is in the lateral position, the speculum, properly lubricated, may be introduced in one of two ways. Sims's own way (Fig. 10) was to hold the middle of the instrument in his left hand and place the thumb and index-finger of the right hand along the blade to be introduced, the last phalanx passing the end, so as to

FIG. 10.



Introduction of Sims's speculum.

FIG. 11.



Another way of introducing Sims's speculum.

be able to smooth out folds and insert the tip of the speculum behind the cervix. In ordinary cases the physician may seize the instrument

with the right hand (Fig. 11), placing the tip of his index at the base of the blade, which allows finer manipulations and leaves the left hand free for separating the labia. The doctor stands behind the patient or sits at the foot of the table. The blade enters the rima pudendi at an angle of 45° with the median line, and follows the posterior wall of the vagina, which runs much nearer a horizontal line than beginners think. When at the fornix the instrument is passed to the left hand and brought beyond the coccyx. When the speculum is in place the examiner imparts a circular movement to it so as to retract the perineum and posterior wall and let in air and light. Sometimes the vagina becomes expanded, the so-called *ballooning*, which has been attributed to atmospheric pressure. But the same phenomenon may be observed in the vagina and the rectum without the entrance of air and is then probably due to muscular contraction. If the os does not become visible and easily accessible by the mere retraction of the posterior wall, it can be made so by hooking a tenaculum—a fine hook—into the cervix and moving it until the os becomes central. If it is just visible, but placed unfavorably, the tip of a uterine sound may be inserted into it and bring it into the desired position. Or instruments called *depressors* may be applied to the vaginal wall opposite the cervical portion. *J. B. Hunter's depressor* consists of a silver-plated flexible copper rod expanding at each end into a flat spoon (Fig. 12).

FIG. 12.



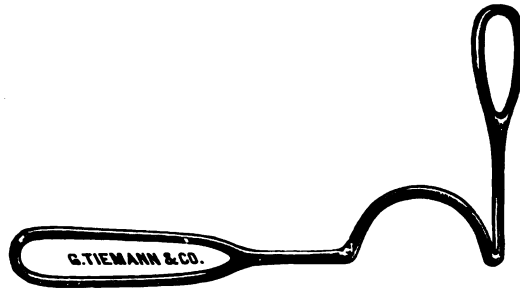
Hunter's depressor.

If the examiner holds the speculum with one hand and the depressor with the other, he has no hand left for palpating, probing, wiping off mucus, etc. This is obviated by *Garrigues's depressor* (Fig. 13), which is made of steel and has one loop that enters the vagina, and another, longer, which serves as handle, and an arch which allows free inspection of the vagina. When the speculum is inserted and drawn backward, the inner loop of the retractor is placed in front of the cervix and pressed against the anterior wall of the vagina, which brings the os forward. Next, the handle is passed to the left hand and held together with the speculum (Fig. 14). A slight movement

with the thumb enables the practitioner to bring the os in view or expose any other portion of the vaginal vault.

*Garrigues's weight speculum*¹ (Fig. 15) is most frequently used in operating, but may also be employed for diagnosis. It is made of

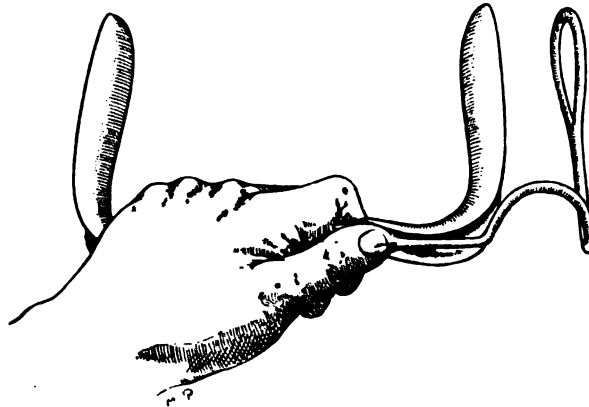
FIG. 13.



Garrigues's depressor.

nickel-plated brass. It consists of a short Sims speculum, with two wings at the base, which adapt themselves to the nates. It is con-

FIG. 14.



How to hold Garrigues's depressor together with Sims's speculum.

nected at an acute angle with a portion that forms a gutter for the flow of blood and irrigation fluid, and it carries near its lower end a heavy bulb of lead, which keeps the instrument in place by its weight, and thus saves one assistant. It is exclusively destined for the dorsal position.

¹Garrigues, "Self-retaining Vaginal Speculum for Operations in the Dorsal Posture," *Med. Record*, May 30, 1896.

Ehrich's speculum (Fig. 16), on the other hand, is only to be used in connection with Sims's position, and is used most for operations. It is made of metal and consists of a Sims blade that may be divided into halves kept apart by means of a set-screw. For the upper nates there is a large wing; for the lower a smaller, and behind a tail, hinging with a staff that has another hinge in the middle. Near this

FIG. 15.



Garrigues's weight speculum.

FIG. 16.



Ehrich's self-holding speculum.

second hinge is a small circular plate, which also turns on a hinge. At the upper end the rod forms a fork, protected with a little bar. When the blade is introduced into the vagina, it is placed, by means of a set-screw, at the angle required. The plate is applied to the sacrum. A band, forming a loop, is passed over the patient's head and applied to her left shoulder, while the other end is fastened to the prongs of the fork. It is of great value in the operation for vesicovaginal fistula, as hardly any assistant can hold a common Sims speculum in his hand so as to keep the field exposed during the necessary length of time.

Before being introduced all specula must be lubricated, but for some, such as that of Garrigues, water that adheres to it after immersion is sufficient. Frequently it is necessary to remove mucus from the os, which is done with a dressing-forceps (Fig. 17).

Cervical specula (Fig. 18) are cylindrical or conical metal tubes with a long movable shaft. They are used less for seeing than for

preventing a medicinal substance destined for the body of the uterus from being rubbed off on the cervix, or for packing the uterine cavity with gauze.

Goelet's uterine speculum consists of a longer and stronger metal

FIG. 17.

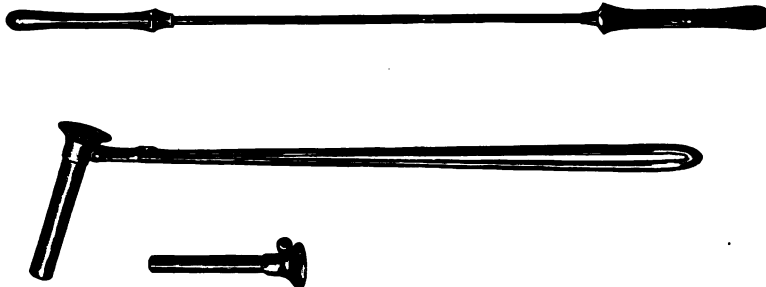


Bozeman's dressing-forceps.

tube with a fixed handle, and is identical with the bladder speculum, presently to be described.

Rectal specula are tubuliform or bivalve (Fig. 19). Since they cause much pain in the sensitive region in which they are applied, they should be used only when absolutely necessary, and then under local anæsthesia.

FIG. 18.



Burrage's cervical speculum.

The *proctoscope* is a long metal tube with flange, handle, and obturator, by which the whole rectum can be inspected and treated.

The *sigmoidoscope* is a similar instrument still longer, with which even the interior of the sigmoid flexure is brought within view and made amenable to localized treatment.

Urethral specula are bivalve, like Caro's (Fig. 20), or tubuliform, like Skene's (Fig. 21).

Skene's endoscope (Fig. 21) consists of a small closed glass tube, like a diminutive test-tube, a handled mirror set at an angle to its shaft,

like a laryngoscope (*b*), and two hard-rubber tubes with flanges, one closed at the end and with a side opening, the other open and slanting, like a Fergusson's vaginal speculum. The patient being in dorsal position with bent knees, the glass tube is introduced through the whole length of the urethra into the bladder. Next, the mirror is inserted into the glass tube and turned around so as to make the neck of the bladder and the whole mucous membrane of the urethra visible. A head-light serves for illumination. Applications may be made to diseased portions by substituting one of the hard-rubber tubes according to the dimensions and locality of the diseased area.



Sims's rectal speculum.

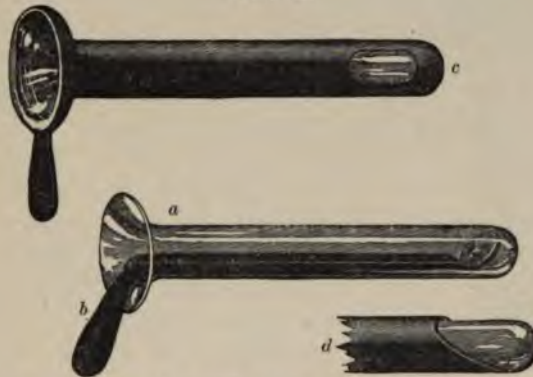
Vesical specula are always tubuliform. Kelly's (Fig. 22) consists of a metal tube with flange, handle, and obturator. Its end is straight. In order to make room for it the urethra must be expanded with a set of dilators (Fig. 23) till its diameter measures from 12 to 15 millimetres, which can be done without causing more than a slight rupture at the meatus, that is the narrowest and most resistant portion of the canal. If it is particularly narrow, it is better to incise it before having recourse to dilatation. The urethra is anæsthetized by leaving in it a match wound with absorbent cotton and dipped in a 5 per cent. solution of cocaine hydrochlorate for 5 minutes; 15 grammes of the same are injected for the same length of time into the bladder. The patient is placed in the genupectoral position. If she cannot remain in this awkward posture long enough for the examination, she is turned on her back and the pelvis is raised on cushions from 8 to 16 inches above the table (Fig. 24). A strong light is held over the symphysis and reflected from a mirror fastened to the forehead of the operator. Before anæsthesia is begun it is advisable to wash out the bladder with saturated solution of boric acid. The bladder is



Caro's urethral speculum.

emptied with a catheter, which admits the air and balloons the organ. Urine that collects later is aspirated with a rubber suction-apparatus (Fig. 25). By elevating the handle the field of vision sweeps over the

FIG. 21.



Skene's endoscope. *a*, glass tube; *b*, handled mirror; *c*, hard-rubber tube with side opening; *d*, hard-rubber tube with open end.

base of the bladder until the region of the interureteric ligament comes into view, often marked by a transverse fold or a different color. By turning the speculum 30 degrees to one side or the other, a ureteral

FIG. 22.



Kelly's vesical speculum.

opening is discovered. That it is the aperture is proved by inserting into it a slender metal rod, the so-called *searcher*, which, if it is

in the ureter, can readily be advanced from two to six centimetres. The searcher may then be replaced by a catheter, from which the urine may be collected, or a bougie. By guiding the catheter with a

FIG. 23.



Kelly's urethral dilators.

finger in the rectum it may be lifted over the pelvic brim and inserted up to the kidney. By wax-tipped bougies an impression may be obtained of a stone in the ureter or the pelvis of the kidney. The urine enters the bladder by intermittent spurts, which facilitate the recognition of the ureteral opening.

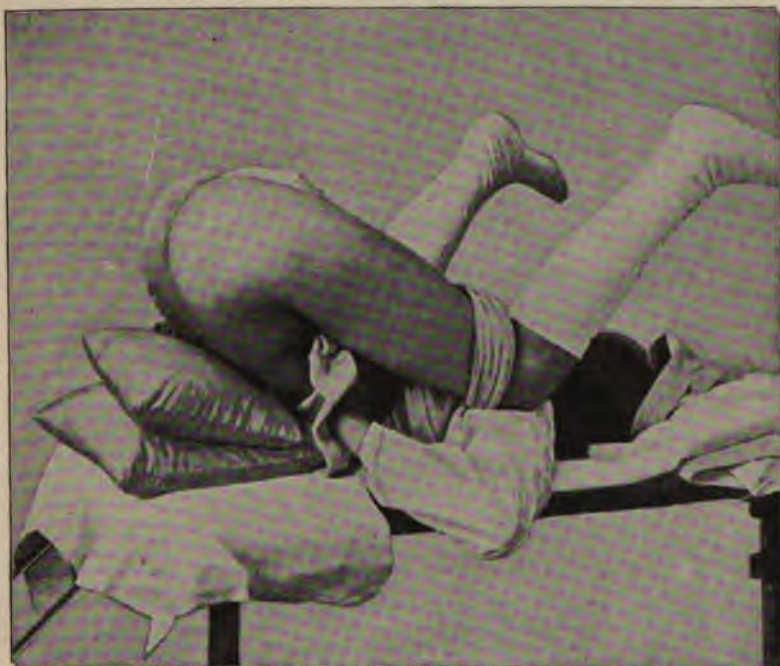
The vesical speculum allows one to see a part of the interior of the bladder and the orifices of the ureters, and to insert instruments into the latter as well as to treat bladder and ureters; but, as we have seen above (p. 18), the forcible dilatation of the urethra, although rarely, may lead to incontinence. This is entirely avoided by the galvanic cystoscope.

Galvanic Cystoscopy.—For examination of the female bladder, which, on account of the short and wide urethra, is much easier than that of the male, Nitze's original examining-cystoscope (Fig. 26) suffices. Externally it is somewhat like a lithotrite. Its component parts are shown in Fig. 27. It consists of a funnel-shaped eye-piece, a shaft, and a beak. The funnel allows the observer to see through the cystoscope; the shaft constitutes the connection with the source of electricity and contains the optic apparatus; the beak carries the light,—the cystoscopic lamp,—the wire of which is made incandescent by closing the galvanic current. It is screwed to the beak and its wire comes in contact with the end of

that in the shaft. This ends in a ring (R II) near the funnel. Parallel to this is another ring (R I), which is in continuity with the metal tube forming the mantle of the instrument (M). Between these two rings the clamp of a conducting cord is fastened, which is connected with the electric source. On the clamp is a movable piece by which the current is closed or opened.

At the connection between shaft and beak there is a prism which turns the rays 90° , and opposite to that a fenestra which allows one

FIG. 24.



Kelly's position for the examination of the bladder and ureters.

to see the interior of the bladder. In contact with the prism is a system of lenses (L I), which turn the picture and make it smaller (P I), but extend the vision (Fig. 28). A second lens (L II) redresses it again (P II), and the ocular (Oc) magnifies it (P III). The instrument allows one to see nearly the whole inner surface of the bladder, and special modifications make even every point visible. The condition of the mucous membrane, foreign bodies, and the quality of the urine entering the bladder through each ureter are seen with great distinctness.

From this instrument, which only serves for diagnostic purposes, has been developed the so-called *ureter-cystoscope* (Fig. 29), by which elastic catheters may be carried into the ureters so as to be able to collect the urine separately from each kidney. Other variations are the *operating-cystoscope*, by which intravesical operations, such as cauterization, crushing of stones, snaring of tumors, may be performed;

the *irrigation-cystoscope*, which may be cleansed without removing it from the bladder; and the *photographing-cystoscope*, by means of

FIG. 25.



Kelly's suction-apparatus.

which a picture of a portion of the bladder may be projected directly on a photographic plate.

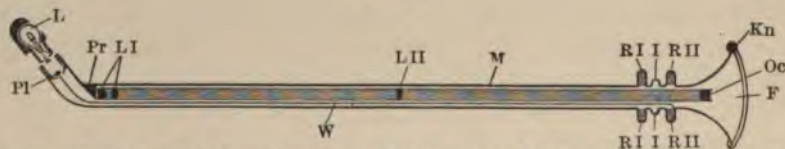
FIG. 26.



Nitze's examining-cystoscope.

The interior of the bladder is protected against the heat of the lamp and its folds smoothed out by filling it with distilled water or a solution of boric acid.

FIG. 27.

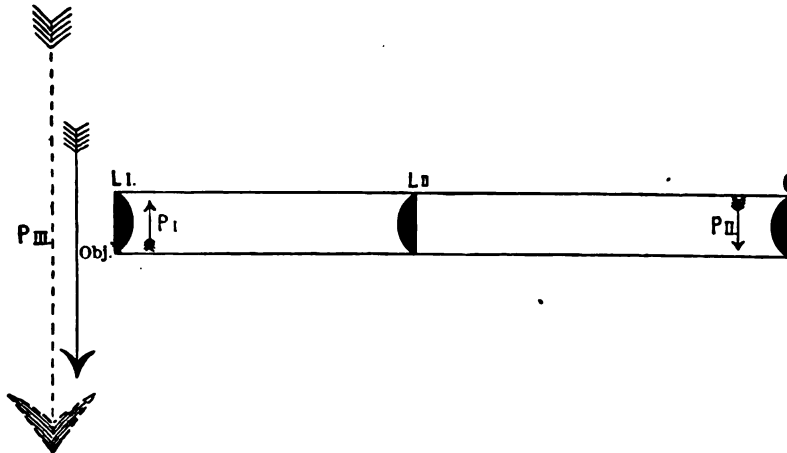


Longitudinal section of Nitze's cystoscope. L, Edison Lamp; F, funnel; Kn, knob on funnel; R I and R II, rings for the contact-clamp; I, isolator between the rings; M, metal mantle; W, isolated wire; Pl, platinum plate at the end of the wire; Pr, prism; L I, lenses, forming the objective; L II, collecting lenses; Oc, ocular.

E. The *uterine sound* (Fig. 30) is a somewhat flexible, silver-plated copper rod, twelve inches long, curved like a male catheter, with a flat

handle at one end and a little knob at the other. Two and a half inches from the knob is a little protuberance with a notch, indicating

FIG. 28.



Optic of cystoscope. Obj., object to be seen; L I, first lens; P I, inverted and diminished picture; L II, second lens; P II, redressed picture; O, magnifying ocular; P III, picture seen.

the normal depth of the uterus, and at a distance of one inch are other notches marked with figures, by which the examiner can easily read off the depth to which the instrument has penetrated.

FIG. 29.



Casper's ureter-cystoscope. *U*, movable lid covering groove in which moves *c*, the ureteral catheter; *h*, handle of lid; *o*, ocular end; *p*, prism; *l*, lamp; *s*, screw for making and breaking connection with the battery.

In using the sound the practitioner should bear in mind that it is a metal rod hard enough to perforate the uterus in spite of the knob,

FIG. 30.



Simpson's uterine sound.

and that it enters a cavity the walls of which abound in lymphatics. He should, therefore, boil it, cool it off with sterile water, and smear

it with a sterile lubricant. Before its introduction the vagina should be irrigated with antiseptic fluid or at least swabbed with the same. It is best to place the patient in Sims's position. The doctor stands at the foot of the table, introduces his left index to the os, slides the sound along the volar surface, inserts the instrument very gently into the cervical canal, and moves the handle backward and upward until the knob reaches the fundus. In the cervical canal the end of the sound may be caught in a vallecule. It should then be retracted a little and given another direction. In passing the internal os, as a rule, a slight yielding resistance is perceived. Before using the sound the physician should always ascertain the shape and position of the uterus. If this is much flexed, the instrument should be bent to conform to it. The introduction is facilitated by pressing the finger in the vagina against the anterior or posterior wall of the uterus. In cases of considerable anteversion the insertion is made easier by holding the sound with the convexity backward until it reaches the internal os, and then turning it forward. If the uterus is bent backward, the instrument is introduced all the way with the concavity backward, and the handle is moved forward.

For measuring the depth of the uterine cavity, the right index is placed against the sound and the anterior lip of the uterus, the instrument being held against the fundus with the left thumb and index. Then the sound is grasped with the right hand and withdrawn, and finally the distance from the knob to the finger-tip is read off.

The use of the sound may be combined with that of a catheter in the bladder or a finger in the rectum or the vagina or fingers pressing down the abdominal wall, whereby tumors in the uterus or its vicinity may be explored. Or the instrument may be used to move the uterus and thus discover its relations to tumors in other pelvic organs.

F. The probe is a slenderer and much more flexible rod than the sound. It may be made of silver, whalebone, or hard rubber. It is used for examining the inner side of the uterine wall and the direction and depth of the cavity when this is distorted by tumors.

G. Curettes are metal instruments consisting of a spoon or loop, a shank, and a handle. They may be stiff or flexible, sharp or dull. They are used for scraping the inner surface of the uterus or fistulous tracts, most frequently for therapeutic purposes,—namely, for removing a diseased mucous membrane,—but also for obtaining specimens for microscopical examination and thus being enabled to make a diagnosis. *Sims's curette* (Fig. 31) is stiff and has a moderately sharp edge, with

which the scraping is done. Simon's *sharp spoon* (Fig. 32) has at the end a little deep spoon with a sharp edge. Thomas's *dull wire curette*, (Fig. 33) is flexible and has at the end a loop with dull edges. Only the part nearest the eye should be flexible.

FIG. 31.



Sims's curette.

All these scrapers come in different sizes. As a rule, the largest that can enter the cavity should be used, being not only more effective, but also safer in regard to perforation.

H. *Dilatation*.—In order to introduce a curette and still more a finger into the uterine cavity, the cervical canal must be dilated. This

FIG. 32.

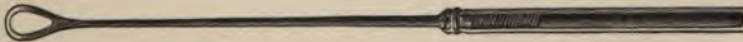


Simon's sharp spoon.

is done either slowly by means of tents or rapidly with coniform instruments or diverging rods.

Tents are cones or cylinders that are made of a substance which attracts fluid and thereby is made to swell gradually. Besides this mechanical effect they have the vital one of making the cervix more

FIG. 33.



Thomas's dull wire curette.

succulent and softer. The material most used nowadays for tents is the frond of *laminaria digitata*, or tangle. *Laminaria* tents are short, smooth, cylindrical sticks of different thickness, and with a little silk loop behind by which they are withdrawn. They are disinfected by immersing them for a minute or two in boiling antiseptic fluid, which also makes them so soft that they can be curved to fit a flexed cervix. On being plunged into cold antiseptic fluid they harden again and retain the curvature imparted to them. They may be kept in a 1 per

cent. solution of bichloride of mercury in alcohol. Just before being used they are dipped in a solution of corrosive sublimate in glycerin, 1:1000. The tent is inserted with a dressing-forceps well beyond the internal os, which is the most resisting point. Since the disinfection of all tents is imperfect, and they come in intimate contact with the mucous membrane and bruise it, this method should not be used for the cervix, if it can be avoided. But, except during or shortly after pregnancy, it is hardly feasible to dilate the cervical canal sufficiently to admit a finger in any other way, and tents are employed also to dilate fistulous tracts. The patient should remain in bed while the tent is in her body. If necessary, several tents may be introduced one after the other, taking each time a larger one, or placing several side by side. The change is made morning and evening and the uterus irrigated each time with antiseptic fluid. The pain caused by the expanding tent may be relieved by a hot-water bag, warm wet or dry cloths, a warm linseed meal poultice, or an ice-bag, combined with an opiate.

Topical dilatation is much safer. For the lowest degree there is a set of twelve cones, each two of which are connected with a common metallic shaft (Fig. 34). They should be made of metal, so that they

FIG. 34.

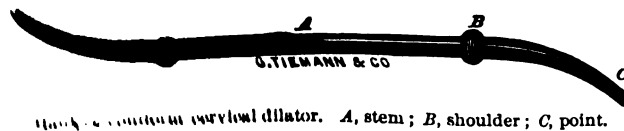


Fig. 34. Continuous cervical dilator. A, stem; B, shoulder; C, point.

may be heated. A little shoulder prevents too deep penetration. The cones are graduated to indicate the circumference in millimetres. The cones used are more than two inches in length. For higher degrees of dilatation than those obtainable by Hanks's dilators, I have devised a set of ten *olive-shaped* hard rubber dilators, with a circumference varying from 33 to 67.5 millimetres, and numbered accordingly on an American scale from 22 to 45. They are screwed to an adjustable shaft (Fig. 35). The largest serves as handle, while the others are being inserted slowly into the canal.

With the conical and olive-shaped dilators press evenly on the cervix, and upward, *expanding dilators* have from two handles, which are separated by pressure on the handles. They are moved evenly lateral, and they should therefore be moved so that they exert their pressure on different points. Some are of the screw-head, such as Wylie's (Fig. 36) and Goelet's (Fig. 37);

others are worked with a screw, to which class belongs Garrigues's (Fig. 38).

Any dilator causes bruises, abrasions, or even small tears. Dilata-

FIG. 35.



Garrigues's olive-shaped cervical dilators.

tion should, therefore, always be done with aseptic and antiseptic precautions. Larger lacerations are not justifiable.

I. *Examination of Virgins.*—A vaginal examination in a pure girl

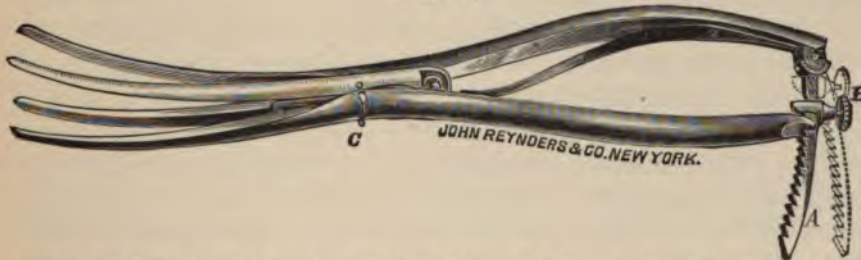
FIG. 36.



Wyllie's expanding cervical dilator.

is both painful and objectionable, in so far as it cannot be performed without permanently depriving the entrance of some of its tightness. If the symptoms are slight, it is best to try the effect of internal medicine,

FIG. 37.



Goelet's expanding cervical dilator. A, rack; B, set-screw; C, articulation of the fourth branch.

and perhaps injections, without making any examination at all. If this treatment has not the desired effect, a rectal examination should be made. If this reveals displacements or other conditions that require local treatment, or if the symptoms are of a more serious nature, a vaginal examination becomes necessary. In some girls the entrance

is so lax that this does not meet with much or any difficulty. If the case is not urgent, the hymen may be softened and gradually dilated by placing in the opening a little ball of cotton dipped in glycerin and secured by a string, and increasing it daily. Even when an exploration must be made at once, by lubricating the finger well and introducing it very slowly, the vagina may be examined without tearing

FIG. 38.



Garrigues's expanding cervical dilator.

the hymen, which ought never to be done for a mere examination. When the finger has passed, a small-sized speculum may also be employed.

III. EXAMINATION OF THE ABDOMEN.—The patient is in the dorsal position, with the knees flexed or extended, or in the ventral position. The physician stands at her side, generally the right. The examination may comprise *inspection*, *palpation*, *percussion*, *auscultation*, *mensuration*, *injection of water into the intestine*, and the *production of carbonic acid in the stomach*.

A. *Inspection*.—Much information may be acquired by merely looking at the abdomen. We notice its size, shape, and color. An enlargement may be general or limited to a certain region. If it is due to pregnancy or a uterine tumor, it forms a more pointed prominence, while a moderate amount of ascites gives the abdomen a flat and broad appearance. Ovarian and parovarian tumors are usually developed in one side. Longitudinal purple-colored lines, so-called *striae abdominales*, suggest pregnancy; scars of a silvery-white color—*striae albicantes*—are in most cases a sign that the woman has borne children. The umbilicus may protrude in consequence of pregnancy, hernia, or a tumor. A dark brown line—*linea fusca*—extending from the symphysis pubis to the umbilicus, or even to the ensiform process, is sometimes a sign of pregnancy, but may be found in brunette virgins.

B. *Palpation* may be superficial or deep. By folding the abdominal wall we judge of the development of the subcutaneous adipose tissue and of the presence or absence of adhesions to other organs or tumors. By exercising a slight pressure one sometimes has a sensation like that in emphysema, which is due to fresh peritoneal adhesions. By deep palpation the examiner tries to ascertain the condition of the abdominal organs or locates a tumor. If one is found, its size, mobility, and connections should be tested. If it is an enlarged uterus, its mobility is best examined by placing the index-finger on the os and moving the fundus from side to side, when the os will be felt to slide in the opposite direction. Sometimes an assistant is needed to lift a tumor while the examiner endeavors to find a pedicle to it. The doctor should notice any particular sensitiveness. A mass that contracts while being manipulated cannot be anything but the gravid uterus. If a patient makes a deep inspiration the liver descends and ascends again under the following expiration, while all tumors may be kept back. Fluctuation is always a sign of an accumulation of fluid. In a case of pregnancy parts of the fetus may be felt. A floating kidney can be moved up and down and is recognized by its shape. An enlarged liver extends more or less downward, but forms one mass with that in the right hypochondrium. The enlarged spleen descends from the left hypochondrium and is often characterized by the indentations on the anterior edge. In appendicitis a tender tumor may be found on the right side, between the umbilicus and the anterior superior spine of the ilium. At the umbilicus the promontory is felt; above it, in the median line, the pulsating aorta; below it, slanting to the sides, the common iliac arteries.

C. *Percussion*.—By percussing the abdomen a tympanitic sound is elicited from the empty intestines, while a tumor or the pregnant uterus yields a dull tone, by which one can describe the exact circumference of the tumor and often find out its starting-point. A dull percussion sound surrounding a tympanitic one in the middle is indicative of free fluid in the abdominal cavity sinking to the lowest part. If the examiner notes the line of demarcation between the clear and the muffled tone and then makes the patient turn over on her side, he will find that the dulness increases below and disappears above.

D. *Auscultation*.—By applying the stethoscope sometimes information of great importance is gained. In this way the fetal heart-sound or fetal movements may be heard, which are absolute proofs of preg-

nancy, while a blowing sound may be the uterine *souffle* found in that condition or be produced in a pathologic tumor. The *bruit* developed in an aneurism is accompanied by expansion and tremor.

E. *Mensuration*.—Measurements are taken with a tape measure. Those most used are the girth at the umbilicus and at the most prominent point of the enlargement, and the distance from the umbilicus to the symphysis pubis, the ensiform process, and the anterior superior spine of the ilium.

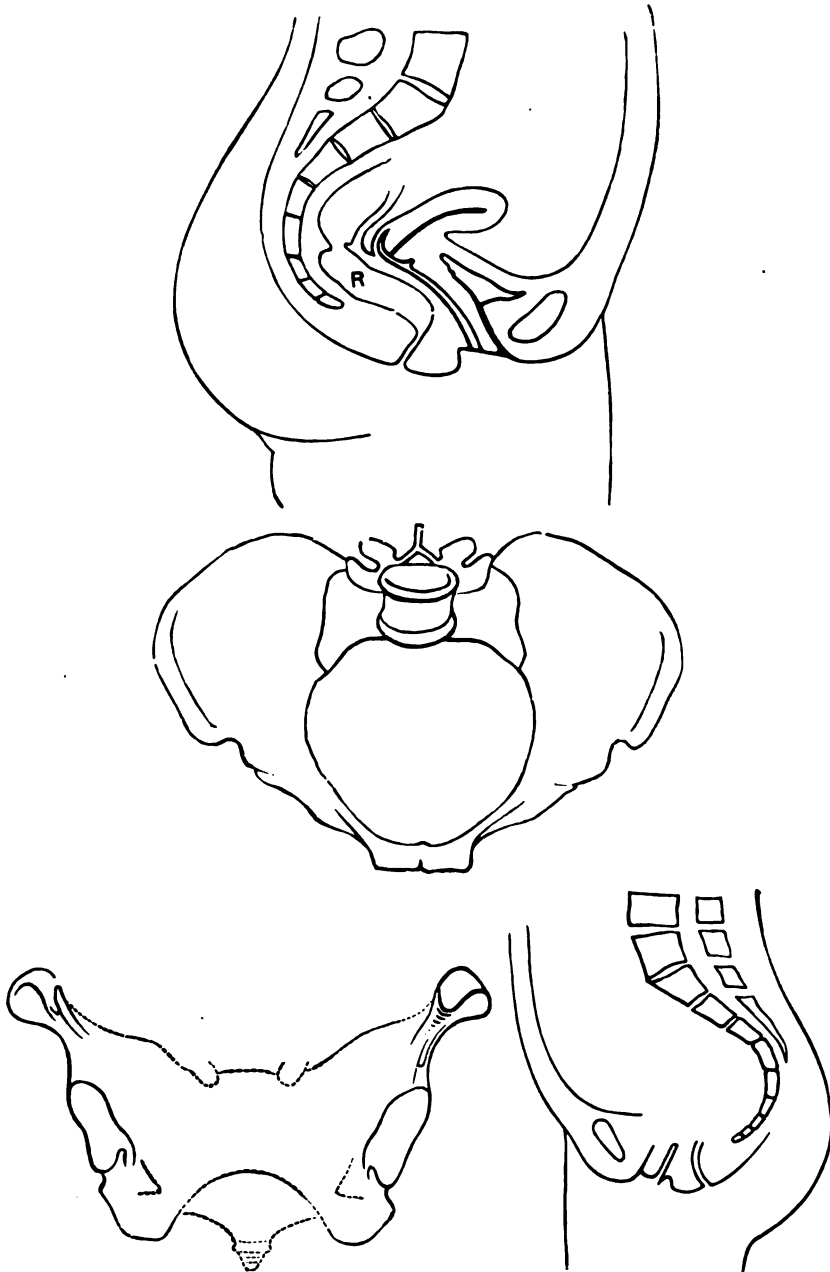
F. *Development of Gas and Injection of Water*.—Carbonic acid may be developed in the stomach by giving the patient bicarbonate of sodium (3ii—8 grammes) and tartaric acid (3iiss—6 grammes). Next, the gas is evacuated with an œsophageal sound, and tepid normal salt solution is injected into the intestine. In this way it may sometimes be discovered whether a tumor has risen from below or descended from above, since it will move towards its base.

G. *Charts* (Fig. 39).—It is time-saving and conducive to precision to have charts giving the outline of the pelvic and abdominal organs, in front and in side view. A simple outline drawn on such figures records as much as a long description.

IV. OTHER MEANS OF INVESTIGATION COMMON FOR PELVIC AND ABDOMINAL DISEASES.—Such are *urinary analysis*, *microscopic examination*, *chemical examination*, *bacteriological examination*, *examination of the bladder and ureters*, *examination under anæsthesia*, *exploratory aspiration*, and *exploratory incision*.

A. *Urinary Analysis*.—The examination of the urine often gives important information. It should be drawn with a *catheter* (Fig. 40), so as not to be contaminated with admixture of vaginal secretion. Catheters are narrow tubes made of soft rubber, glass, or metal. They should be thoroughly disinfected before being introduced. If the object is only to obtain urine, a soft catheter may be used, and it is more comfortable for the patient; but for finding strictures in the urethra or foreign bodies or tumors in the bladder a hard instrument is required. It should have several small holes near the end, not one or two large ones, in which the mucous membrane may be caught, for then the withdrawal becomes painful. The catheter should be made aseptic by boiling and kept in a mild antiseptic solution. Before inserting it into the bladder, the surroundings of the meatus urinarius should be washed off with some mild antiseptic, or, in private practice, at least clean water, so as not to carry any secretion from the vulva or vagina, which always contains microbes, into the bladder, where they may set

FIG. 39.



Set of rubber outline stamps.

up inflammation. The patient lies in the dorsal or left lateral position. The labia majora are kept separated with the thumb and index of the

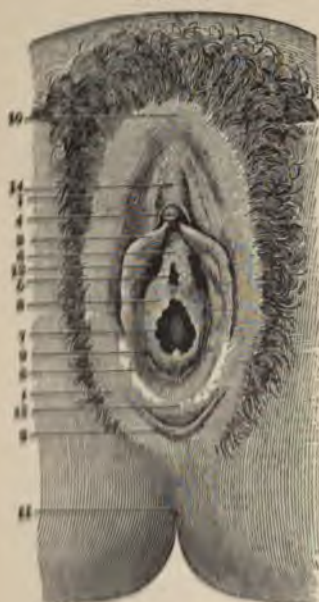
FIG. 40.



Glass catheter.

left hand. If the meatus is not visible it can always be found by introducing the catheter midway between the two blind recesses which

FIG. 41.



Virginal vulva. 1, labia majora; 2, fourchette; 3, labia minora; 4, glans clitoridis; 5, meatus urinarius; 6, vestibule; 7, entrance to the vagina; 8, hymen; 9, orifice of Bartholin's gland; 10, anterior commissure of labia majora; 11, anus; 12, blind recess; 13, fossa navicularis; 14, body of clitoris.

are seen in the upper part of the vestibule (Fig. 41). The catheter should be made to hug the pubic arch in a circular line, similar to that followed in the male. By holding a finger in the vagina while the catheter is moved all over the bladder, a thorough examination may be made, which at once would reveal the presence of a stone or other foreign body or a tumor situated at the base of the bladder. The urine thus obtained should be examined chemically, microscopically, and, under some circumstances, bacteriologically. The chemical examination is directed particularly against albumin, sugar, and bile. No person should be anæsthetized before her urine has been examined. If it contains albumin, most surgeons hold the use of chloroform to be safer than ether. The sediment obtained by letting the urine stand in a conical glass, or rapidly by means of a centrifugal machine, is examined for epithelial cells (Fig. 42), casts, pus-corpuscles, blood-corpuscles, leucocytes, and crystals.

It is sometimes important to obtain the urine separately from the two kidneys. This may be done in the following way: The bladder having been washed out and emptied and the urethra and bladder

having been made insensible with cocaine and dilated as described above (p. 26), the patient is placed head downward on an inclined table forming an angle of about 55° with the horizon. She is prevented from falling by a folded sheet passed behind her neck and in

FIG. 42.

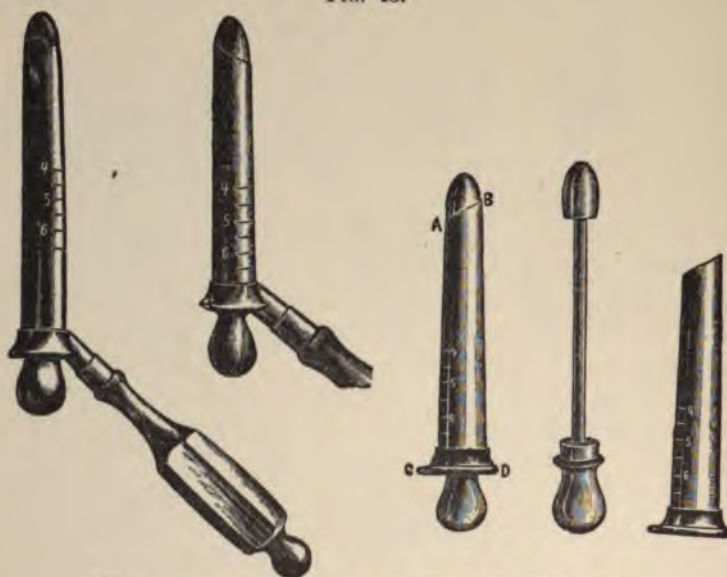


Epithelial cells found in urine. $\times 500$ (C. Heitzmann). *B*, from the bladder, superficial layer; *BM*, from the bladder, middle-layers; *BD*, from the bladder, deepest layer; *P*, from the prostate; *E*, from the ejaculatory duct; *V*, from the superficial layer of the vagina; *VM*, from the middle layers of the vagina; *VD*, from the deepest layer of the vagina; *C*, from the outer surface of the cervix; *U*, from the cavity of the uterus; *PK*, from the pelvis of the kidney; *KC*, from the convoluted tubules of the kidney; *KS*, from the straight tubules of the kidney.

front of her shoulders and held by two assistants, each of whom with the other hand holds one of her legs. The thighs are so strongly flexed as to be almost horizontal. By this position the bladder, especially the part nearest the internal urethral opening, becomes the highest point of

the abdominal cavity. The bladder is kept down by the symphysis pubis and the recti muscles, so that when it is distended by the intruding air the fundus sinks deeper, and the urine from both ureters falls into this hollow until it is full. In the meantime the ureteral openings are located and the urine collected from each separately by means of a speculum made for the purpose (Fig. 43). It has a slanting end, which adapts itself closely to the vesical mucous membrane around the ureteral openings. It also has an obturator and a handle. Its lumen is one centimetre in diameter. On the shorter side is a scale, which is

FIG. 43.



Rose's speculum for collecting urine separately from the ureters.

read by one of the assistants. The urethra being about $2\frac{1}{2}$ to 3 centimetres long, and the distance from the inner opening of the urethra to the orifice of the ureter about the same, the whole distance to which the speculum must enter is about $5\frac{1}{2}$ centimetres. The physician stands between the legs of the patient, which are separated as much as possible. The labia are held apart by that assistant who stands on the side of the ureter to be inspected. At first the handle points straight upward and the tube is nearly perpendicular. Then the outer end of the speculum is lowered somewhat and the instrument inserted $5\frac{1}{2}$ centimetres. When the obturator is withdrawn, one sees plainly, by

good daylight, by gaslight and a head-reflector, or by an electric head-lamp, the lower part of the anterior wall of the bladder. Next, the instrument is applied to the wall of the bladder and the outer opening of the tube is carried over to the side opposite the one to be examined, at the same time lifting it a little and rotating it so as to turn the handle outward and downward, until it stands about midway in the lower quadrant of the urethra on the side to be inspected. The ureteral opening forms a depression on the top of a little mound, which may be absent, when the opening is seen with difficulty as a semicircular slit, or even this may be invisible, and then the only way of finding it is to notice the periodical spurts of urine rising from it. When the speculum is placed correctly it surrounds one of the ureteral openings and is pressed against the wall so that the urine from this ureter rises in the tube, whence it is aspirated with a syringe. This method is superior to all others by combining reliability with safety. By introducing instruments into the ureter there is always risk of carrying infecting material into it. For instance, if one kidney is tuberculous and the surgeon, with a view of satisfying himself that the other is healthy, introduces a catheter into the corresponding ureter, he may in so doing carry tubercle bacilli into it and lay the foundation of a similar affection of the second kidney.

The size, sensitiveness, and elasticity of the bladder may be tested with a male urethral sound and by filling it with normal salt solution until an unpleasant tension is perceived by the patient.

Palpation of the Ureters.—The ureters may be felt as round, somewhat flattened cords about $\frac{1}{8}$ inch wide to the sides and in front of the cervix. They can be moved laterally and hooked over the index-finger. The examination may be done either bimanually, in the dorsal position, or in Sims's. For further details the reader is referred to the chapter treating of DISEASES OF THE URETERS.

B. *Microscopical examination* is of great value for diagnosis. We have already spoken of it as applied to urine. It is used also for fluids obtained by aspiration and for solid tissues. For instance, a single hooklet or the smallest fragment of the stratified cuticula are pathognomonic for an echinococcus. The examination of scrapings from the interior of the uterus or a wedge cut out of the cervical portion may determine whether a patient has cancer or not.

By examining the blood we can ascertain whether the patient suffers from anæmia, chlorosis, leukæmia, or malaria, which may be of importance in deciding on the performance of operations. Of still

greater value is the discovery that suppuration anywhere—a pelvic exudation, a pyosalpinx, pyometra, etc.—is revealed by an increase in the number of leucocytes in the blood. While this normally varies between 6000 and 10,000 in a cubic millimetre, suppuration may bring it up to 30,000 or 35,000.

The field of microscopy has been enlarged since the creation of *bacteriology*, this new branch of investigation which is totally based on it. Tubercle bacilli, gonococci, streptococci, staphylococci, bacterium coli commune, bacillus diphtheriæ, and bacillus tetani are of particular interest.

C. *Examination under Anæsthesia*.—By excluding pain and causing relaxation anæsthesia becomes sometimes a help in diagnosis. Not only should the surgeon always before beginning to operate make an examination of the pelvis and abdomen, but occasionally it may be proper to anæsthetize the patient for mere diagnosis, without any operation following. However, since it is more or less unpleasant to be anæsthetized and the procedure is not altogether free from danger, this means of information has very narrow limits.

FIG. 44.



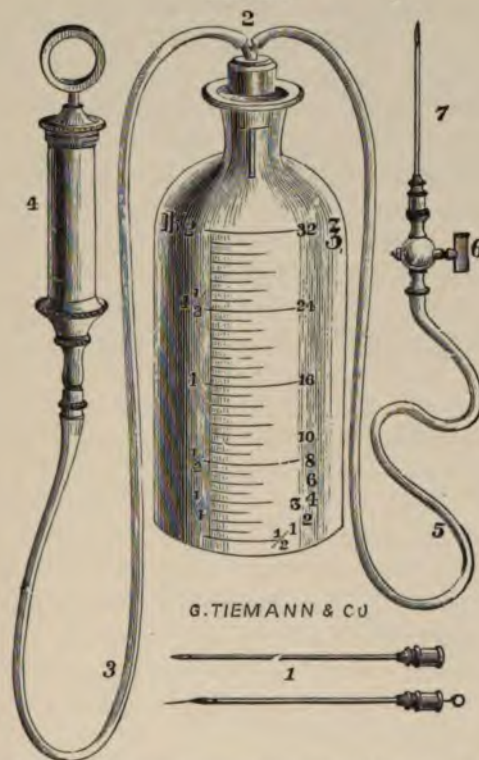
Exploratory vaginal aspirator.

D. *Exploratory Aspiration*.—In order to ascertain whether there is fluid or not in a suspected locality or to obtain some of it for examination an aspirator needle is introduced and suction made with a hypodermic syringe or a somewhat larger aspirator or a bottle connected with a pneumatic pump. For use in the vagina I have had a little syringe made with an attachment by which the piston can be pulled out (Fig. 44). If a large amount of fluid shall be evacuated the needle may be connected with a rubber tube, the end of which is kept under water, or Potain's aspirator (Fig. 45) may be employed. Before using an aspirator both the needle and the skin it is going to perforate should be disinfected. After the little operation the opening is pressed together, and if necessary closed with adhesive plaster.

Unless a very fine needle is used, it is best to empty a cyst in the abdomen entirely in order to prevent the contents from flowing into

the peritoneal cavity after the withdrawal of the needle. Under such circumstances the aspiration ought not to be performed in an office or a dispensary and the patient should be kept in bed for four days. In fact, so serious, even fatal, consequences have followed the aspiration of cyst fluid that the method has nearly been given up for such cases.

FIG. 45.



Potain's aspirator. In the middle is a clear glass bottle with a scale showing the amount of fluid evacuated. It is closed by a rubber stopper, through the centre of which passes a double-current tube (2). Attached to it are an elastic hose (3) with an exhausting-pump (4) and another elastic hose (5) with a stop-cock (6), to which fit needles and trocars of different sizes (7).

The needle should be pushed rapidly through the resisting skin, but slowly through the deeper tissue, so as to give arteries which are in the way time to be pressed aside and not punctured.

E. Exploratory Incision.—This is a method that in most cases is preferable to aspiration. The section may be abdominal or vaginal. The former is usually made in the median line and large enough to

admit one or two fingers. It may lead to an operation or it may show the latter to be contraindicated. Then the opening is closed with sutures and dressed as after laparotomy. The incision in the vagina is generally made behind the cervix, either transversely at the uterovaginal junction or longitudinally in the median line, extending from the cervix to the bottom of Douglas's pouch. It should be long enough to admit two fingers, which allows one to explore the whole pelvis.¹ Only the vaginal wall should be cut through with a knife, after which the deeper tissue is separated with the finger and closed scissors. Exceptionally it may be necessary to make the incision on the anterior wall. Then it is made transversely at the uterovaginal junction and the bladder is separated from the uterus.

Besides these special gynecological examinations enumerated in the preceding pages, the physician should pay attention to pulse, temperature, respiration, the condition of other organs than the genitals, the composition of the blood, and the general health.

¹ Garrigues, "Vaginal Hysterectomy and Oöphorectomy after Symphysiotomy," *Medical Record*, February 23, 1895, vol. xlvii., No. 8, p. 234.

CHAPTER IV

TREATMENT IN GENERAL.

THE treatment of gynecic diseases is *preventive* or *curative*, the latter may again be *internal*, *electrical*, or *external*.

§ 1. **Preventive Treatment.**—What ought to be done to prevent diseases of women appears as corollary to what has been said about etiology in general. At puberty girls should not be overworked, and at at no time practicing, especially on the piano, should be carried so far as to engender nervousness. In sexual relations the laws of nature should be strictly adhered to and proper moderation observed. The skin should be kept clean. The muscles should be strengthened by exercise, gymnastics, and bodily games. At least one hour daily should be spent in the open air, and horseback-riding, bicycling, and out-of-door games are preferable to walking and still more to driving in a carriage. Wholesome food should be taken at regular meals and in sufficient quantity. An evacuation from the bowels should be had at least once in twenty-four hours. The bladder should be emptied when the desire to do so presents itself. Dress should aim less at finery than at proper protection against inclement weather. In a changeable climate it is best to have underwear of wool or silk, heavier or lighter, according to the season. Women should have open drawers so as not to be prevented from urinating when the desire is felt. Children and young women should not use corsets. Young and old should keep early hours. During menstruation they should avoid exposure and coition. If they are afflicted with chronic inflammation of the ovaries, they had better not marry. Accoucheurs should adhere strictly to the rules of antiseptic and aseptic obstetrics. After child-birth women should remain in bed until the uterus has subsided into the pelvis.

Lacerations of the perineum should be sutured at once, and those of the cervix ought to be operated on after involution if they have not healed spontaneously. Women should be told that they jeopardize their lives by undergoing the treatment of abortionists or by trying themselves to destroy their unborn offspring. In miscarriages not only the ovum but the decidua should be removed and the patient kept in bed

for a week.¹ Men who have had a gonorrhoea should not marry until a competent andrologist has found their urethra healthy. Those who have been affected with syphilis should not marry until they have been free from any symptom of the disease at least two years. It need hardly be added that it is despicable and in some States criminal to have intercourse while one has a chancroid.

§ 2. **Internal Treatment and Diet.**—Few diseases of women, strictly so called, can be cured with internal treatment alone, but it may be a valuable or even indispensable adjuvant to other methods. The body is one entity and the different organs intimately connected, either anatomically or physiologically. In order to successfully treat a disease of the genitals, it is often necessary to strengthen the nervous system, correct digestive disturbance, and improve the blood crasis.

Diet.—Most of the women who have a disease peculiar to their sex are anæmic and lose their appetite. A chief indication is, therefore, to make them take as much albuminoid food as they can digest, and frequently it is useful for them also to take wine or beer, with their meals, which increases their appetite. In acute cases milk, in its natural condition, boiled, peptonized, or fermented (kumyss), and the juice of raw, boiled, or broiled beef are the staple articles of food.

If the digestion is defective it is well to give pepsin and muriatic acid with the meals. In severe cases even *rectal alimentation* may become necessary.

Gynecic patients commonly are *constipated*. In many cases it suffices to make them drink before breakfast a quart of boiled or distilled water in four portions, with a quarter of an hour's interval. In others a saline aperient, such as Carlsbad sprudel salts, "German salts" (*i.e.*, artificial Carlsbad salts) or sodium sulphate or phosphate in a tumblerful of hot water, takes the place of the plain water. It is better to give a small daily dose than to prescribe a full one off and on. Some prefer to take a teaspoonful of compound liquorice powder in the evening.

R Ferri sulphatis,
Potassii carbonatis, āā 3ii (8 grammes);
Aloes socotrinæ, gr. xv (1 gramme);
Extr. gentianæ comp., q. s.;
Ft. pil. No. lx.
Sig.—3 pills 3 times a day, after meals,

¹ Garrigues, "Text-book of Obstetrics," 1902, p. 571.

is an excellent combination, to which strychnine and belladonna may be added. By gradually diminishing the aloes a cure of the constipation may be effected.

Sometimes *nausea* or *vomiting* call for the administration of drugs, such as bismuth, tincture of iodine, creosote, hydrocyanic acid, tincture of nux vomica, hydrochlorate of cocaine, oxalate of cerium, etc. In some cases the following formula is a useful combination against nausea:

R Caroid, \mathfrak{Zss} (2 grammes);
Salol, gr. xxxvi (225 centigrammes);
Sodii bicarbonatis, \mathfrak{Zi} —M.
Div. in chartas amylaceas No. xii.
Sig.—1 wafer 3 times a day.

Tonics, such as iron, manganese, arsenic, strychnine, and phosphorus, red bone-marrow, are nearly always indicated. In tympanites strychnine is very effective.

Anodynes should, in chronic cases, be used cautiously to avoid creating a habit; but at times opium, morphine, codeine, heroine, phenacetin, or conium are indispensable. Iodoform or aristol suppositories inserted into the rectum dull pelvic pain. Headache is often banished with magic promptitude by the following powder:

R Phenacetini, \mathfrak{Zi} (4 grammes);
Caffeinæ, gr. xxiv (125 centigrammes);
Sodii bromidi, \mathfrak{Zii} (8 grammes).—M.
Div. in chartas ceratas No. xii.
Sig.—1 powder, repeated if needed after 1 and 3 hours.

To quiet the excited nerves bromides often are required. An embrocation composed of chloroform with 3 parts of olive oil or

R Chloroformi \mathfrak{Zss} (15 grammes);
Spiritus ammoniæ, \mathfrak{Zii} (8 grammes);
Spiritus camphoræ q. s. ad \mathfrak{Zii} (60 grammes).—M.

gives at least temporary relief from the troublesome backache. Insomnia must be broken with hypnotics, such as trional, sulphonal, acetanilid, chloralamid, hydrobromate of hyoscine, or phenalgin.

In chronic inflammations *resolvents*, particularly iodide of potassium, chloride of gold, and bichloride of mercury, are indicated.

Hæmostatics.—In acute uterine hemorrhage ergot, hydrochlorate of hydrastinine, stypticin, and suprarenal capsule are the chief remedies. Merck's stypticin comes in tablets containing 5 centigrammes ($\frac{5}{8}$ grain), one of which is given from 3 to 8 times daily. The dried and powdered suprarenal capsule is given in doses of 10 grains and simultaneously used in a 5 per cent. emulsion for packing the uterus. The extract called adrenalin is administered as "Solution adrenalin chloride 1 : 1000," or "Suprarenal liquid with chloretone," both manufactured by Parke, Davis & Co., in doses of $\text{m} \text{v} \text{---xxx}$ (30 centigrammes—2 grammes).

In chronic cases the rasped bark of the root of the cotton plant, in a decoction (*Gossypii radices cortex raspatus*), 3 heaping teaspoonfuls to a pint of water, boiled for 15 minutes, strained and taken cold, one-third 3 times a day, is the best drug.¹ This freshly-made decoction is very much more efficacious than the fluid extract.

The desiccated mammary gland of the sheep, in tablets made by the Armour Company in Chicago and the Mulford Company in Philadelphia, each containing 2 grains of the dry powder, checks the hemorrhage caused by uterine fibroids.

Special conditions influence the choice of medication. Thus, if the bleeding is caused by nervous excitement, bromides, opium, and cannabis indica are indicated. In malaria, quinine and arsenic should be prescribed; in syphilis, mercury; in heart disease, digitalis. Arsenic is also good in bleeding at puberty, in young anæmic women, and at the climacteric.

Among astringents gallic acid and alum are used. No kind of chalybeate should be given, as all iron preparations increase the loss of blood. Even between hemorrhages it should be prescribed cautiously and watched closely. The same applies to alcohol.

Antipyretics.—In acute cases it is sometimes necessary to reduce the temperature, which is done with quinine, salicylate of sodium, antipyrin, antifebrin, or phenacetin.

§ 3. **Electric Treatment.**²—Electricity is not used much by gynecologists, one reason of which, as stated by a member of the American Gynecological Society, is doubtless that it does not pay as well as operative work. The same society had appointed a committee of four

¹ Garrigues, "The Bark of Cotton Root as Uterine Hæmostatic," *The Postgraduate*, January, 1887.

² Garrigues, "Electricity in Gynecology," *Med. News*, June 11, 1898, and *Trans. Amer. Gyn. Soc.*, vol. xxiii., p. 78.

to report on electricity, three of which reported favorably, the fourth—himself the author of a book on electricity in gynecological practice—adversely. I think the general practitioner, especially one who does not perform major operations, as well as his patients, will derive much benefit from the use of this wonderful power. All forms of electricity are available,—*franklinism*, or *frictional electricity*; *faradism*, or *inductional electricity*; *galvanism*, or *chemical electricity*; and *X-rays*, or *Röntgen rays*.

FRANKLINISM may be looked upon as a general nerve tonic, and may be used as a counterirritant in hyperæsthesia and neuralgia.

FARADISM.—One electrode may be applied wet to the abdomen, in the shape of a pad made of a lead plate, with many holes and cov-

FIG. 46.



Garrigues's vaginal electrode.

ered with felt or with chamois and an intervening layer of punk, the other, wound with wet cotton, to the vaginal vault (Fig. 46), or in the cervical canal (Fig. 47). Or both poles may be combined in one

FIG. 47.



Garrigues's cervical electrode.

instrument (Fig. 48), the advantage of which is that, being less painful, a much stronger current may be used. The faradic current is employed for causing muscular contraction and thereby arresting hemorrhage and restoring impaired tonicity. The *high-tension current* is produced by a faradic machine with a very long secondary coil, nearly 8000 feet (Fig. 49). It may be used for similar purposes as the common faradic apparatus, but has besides that great analgesic power, and is, therefore, of great value in the treatment of chronic inflammation of the ovaries and other painful diseases.

The faradic current is generally applied three times a week, each sitting lasting from ten to thirty minutes. The electrodes should be applied first and the current turned on slowly, the strength being regulated by the sensation of the patient. Before withdrawing the electrodes the current is gradually weakened and finally stopped, in

order to avoid hurting the much more sensitive vulva. By turning the current on and off slowly, a much stronger one can be borne than if it is applied suddenly.

GALVANISM.—As strong currents are needed, a battery of at least thirty Bunsen cells or forty Leclanché cells must be provided—that is, sixty volts—

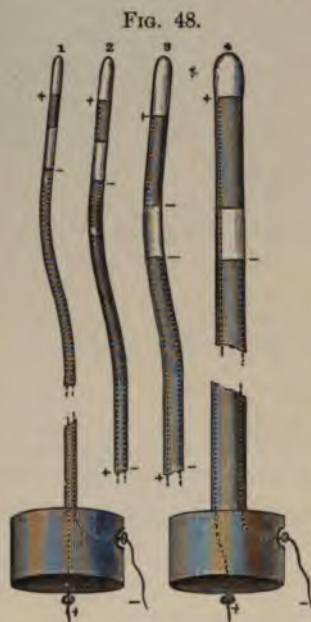


FIG. 48.
Apostoli's bipolar uterine and vaginal exciters. 1, small uterine; 2, middle uterine; 3, large uterine; 4, vaginal, also used in the uterus after confinement.

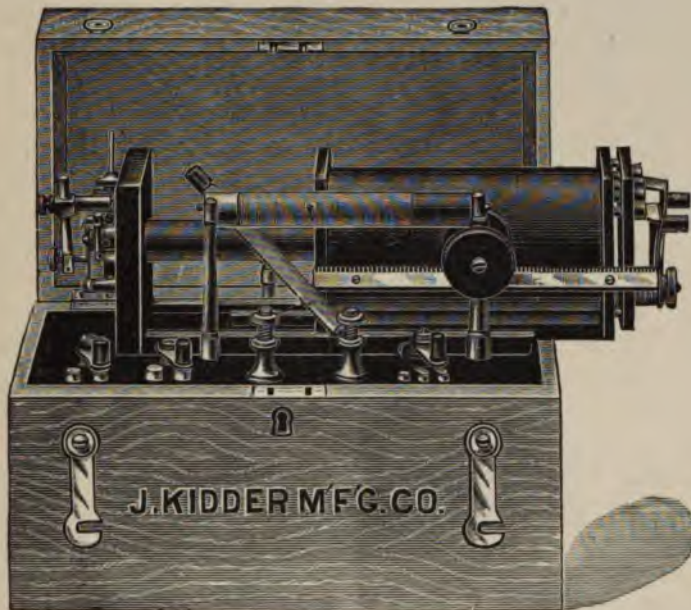
and it is better to have a little more. For the abdomen a pad of six by seven inches is required. For the vagina the electrode represented in Fig. 46, wound with a copious amount of absorbent cotton, will be found serviceable. For use in the interior of the body of the uterus I have constructed an electrode (Fig. 50), the first two inches of which are made of platinum; the middle is a brass rod insulated with hard rubber, and the proximal end is split for the reception of the tip of the rheophore. It is necessary to have an apparatus with "collector," or similar arrangement, or a *rheostat*, by which the strength of the current can be increased and diminished very gradually, and a milliamperemeter, by which is measured how much electricity the patient receives. By using large wet electrodes we chiefly obtain the interpolar effect, which is that of

electrolysis, while by employing small and dry ones the effect is mostly polar, which, when the current is strong enough, becomes *chemical cauterization*. When one combines a large wet outer electrode with a small dry inner one, he may cauterize the inside of the uterus without doing any harm to the skin. Medicinal substances, such as cocaine or iodide of potassium, applied to the anode, are carried by *cataphoresis* into the tissues.

Qualities of the Poles.—The two poles of a galvanic battery have different chemical and physiological effects. The positive pole attracts acid, produces a hard eschar, dries the tissue, and relieves pain; the negative attracts alkali, makes a softer eschar, and renders the tissue succulent. The former is, therefore, used against hemorrhage, leucorrhœa, and pain; the latter in amenorrhœa, or to soften a fibroid.

Apostoli's Method.—The patient occupies the dorsal position. The vagina is irrigated or swabbed with antiseptic fluid. The intra-uterine electrode is inserted to the fundus. The lower part of the abdomen is covered with the pad. If there are denuded places they must

FIG. 49.



Rockwell's high-tension apparatus.

be protected with a small piece of paper. The current should not be turned on till all pain caused by the introduction of the inner electrode has ceased. When pain is felt in the skin, the physician should

FIG. 50.



Garrigues's intra-uterine electrode.

wait a little, for it passes off when the current has penetrated the epidermis. The first time not more than 50 M. (milliamperes) should be given, and rarely more than 100. The patient ought not to feel any severe pain. The current is applied from 5 to 10 minutes, when the

vagina is again disinfected. This treatment can safely be given in the doctor's office and the patient come and go by car. She ought, however, to rest when she reaches her home, and no connection should take place during the whole course of the cure. The application may be repeated two or three times a week, and the patient should be directed to use carbolized vaginal injections twice a day. From twenty to thirty sittings or more may be required. After the treatment, uterine colic is often felt, which may last for hours or even till the next day. If so, the patient should remain in bed and put an ice-bag above the symphysis pubis. There may be also a show of blood, and when the eschar disintegrates there is always a little seropurulent discharge. In rare cases there may flow a profuse watery fluid from the uterus. But soon the patient will feel the beneficent effect in diminished pain and hemorrhage. As a rule, the sittings are discontinued during menstruation. If pain and rise in temperature denote an inflammatory process, the treatment is also interrupted, and it becomes a question whether it should be resumed or not. Apostoli's method is particularly indicated for myomas, but should only be used if the os is accessible. For diseases of the appendages it is better to apply the interior electrode to the vaginal roof.

Chemical Galvano-cauterization of the Cervix.—Recalcitrant cases of granular os may speedily be cured by holding the vaginal electrode covered with very little, nearly dry, cotton, to the affected part for five minutes once a week. The same applies to the intracervical electrode.

Thermal Galvano-cauterization differs from the chemical by using heat as the therapeutic agent. It requires a different apparatus with a small number of large plates. The apparatus produces a large quantity of electricity, which, being led through a platinum wire, renders it incandescent. Thin wire may be formed into a loop and used for amputating the cervix. Thicker wire is formed into knives, needles, and domes for cutting and cauterizing. In this way tumors or organs may be removed without any loss of blood, but for that purpose it is essential to work with a knife kept at a dull red heat, and never allowed to reach the glaring white one. If the wire loop is used it is tightened slowly. By pulling on the part below the constriction it is possible to remove a lengthy cone of tissue. If necessary, a furrow is made for the wire by means of the cautery knife. A needle-shaped cautery may be used for *ignipuncture* in the cervix or in the ovary. The cautery should always be applied cold and the current turned on when it is in place. Thermal galvano-cautery has not only the advantage over

other cauteries that it can be formed as a loop, but it gives off less irradiating heat, and, on the other hand, modifies tissue at a distance from the surface touched. Thus it scorches the surrounding tissue less than other cauteries and gives rise to less inflammation and sepsis than operations performed with the cold knife. Where there is much degenerated tissue to be removed, it is often better to do that with a curette before applying the galvano-cautery; but then bleeding should first be stopped by irrigation with creolin, compression, and closure of open blood-vessels with the cautery. After having wiped it dry, the whole surface is repeatedly gone over with the dome-shaped cautery until every raw spot has been seared and made dry. Finally, the cavity is tamponed with iodoform gauze.

Galvanic heat, combined with pressure in special forceps, may even be substituted for ligation of blood-vessels and pedicles.

X RAYS have been used to combat cancer of the cervix, but do not seem to be very effective.

Indirectly, electricity helps the operator by giving a powerful *light*, which can easily be made portable and introduced into deep cavities.

§ 4. **External Treatment.**—A. APPLICATIONS.—Medicinal substances may be applied to the vulva, vagina, or uterus. It is done best with the patient in Sims's position. The parts are exposed with a bivalve speculum or, better, a Sims speculum with Garrigues's depressor. A very small ball of absorbent cotton is seized with a dressing-forceps and dipped in tincture of iodine, with which the vaginal vault and more or less of the lower wall are painted. The application is

FIG. 51.



Applicator.

hardly felt in the deeper part of the vagina, but in the vulva and on the skin it causes a burning sensation. The superfluous fluid should, therefore, be wiped off with dry cotton before the patient resumes the erect position.

In the interior of the uterus an applicator is needed (Fig. 51). This is a small, flat, coniform rod of hard rubber, which is wound with absorbent cotton. As it sometimes happens that the cotton leaves the applicator when this is withdrawn, it should be so long that part of it hangs out of the os, whence it can easily be pulled out by seizing

it with a dressing-forceps and turning it. A thin layer of absorbent cotton is shaped into a parallelogram, about one inch wide and three inches long. The applicator is held a little inside of one end, and care is taken to cover the point well. By turning the instrument, the cotton is wound smoothly around it in a spiral. Often the cervical canal is full of thick mucus, which must be wiped off with dry cotton; or, if that is not feasible, it is first coagulated by touching it with a mixture of equal parts of tincture of iodine, carbolic acid, and tannin. If the canal is too narrow to admit the applicator, it must first be dilated.

For application to the endometrium, tincture of iodine, liquor ferri chloridi, carbolic acid (all undiluted), ferripyrin (20 per cent.), chloride of zinc (20 per cent.), and nitrate of silver (from 5 to 8 per cent.), are the fluids most used. Many patients being very sensitive to intra-uterine

applications, it is best to touch only the cervical canal the first time and gradually go deeper. As a rule, the vaginal and uterine application is made twice a week. Applications are made also to the skin of the abdomen, especially tincture of iodine or a salve composed of equal parts of ichthyol and lanolin. This is repeated every day.

B. INJECTIONS.—Water or medicated fluids may be injected into the vagina, the uterus, the rectum, the bladder, under the skin, or into a vein. *Vaginal injections* are best taken in the dorsal position lying on a douche-pan (Fig. 52); but patients who must help themselves often sit on the hop-

FIG. 52.



Douche-pan.

per of a water-closet, on a toilet-jar, or on a bidet, or stand over the corner of a chair on which is placed a chamber-pot. The fluid comes from an *irrigator*, a little pail of glass or metal, or from a so-called *fountain syringe* (Fig. 53), a rubber bag with a long soft-rubber tube and hard-rubber nozzles. The vaginal nozzle has several openings near the end, and should be inserted so deeply that the openings are in the deep cul de sac behind the cervix and not in front of the os, for a few

drops of fluid accidentally entering the uterus give rise to a painful and alarming uterine colic.

For combating inflammation and exudation plain hot water is the best. Not less than two quarts should be used. It should, as a rule, be taken as warm as the patient can bear it, from 110° to 120° F.; but some women have so little perception of heat in the vagina that they scald themselves, and in some hot water increases the pain. Then lukewarm water should be substituted.

Cold fluids are injurious. If the injection is used only for cleanliness, for instance if the patient wears a pessary, a pint of lukewarm water suffices, to which may be added with advantage a teaspoonful of bicarbonate or chloride of sodium. The douche is often made astringent by adding borax, alum, sulphocarbonate of zinc (a teaspoonful to the pint), or a mixture of equal

parts of alum and sulphate of copper (half a teaspoonful to a pint). If the cervical portion is spongy and inclined to bleeding, liquor ferri chloridi (half a teaspoonful to the pint) is the best. Antiseptic douches are made by adding carbolic acid or creolin (from 1 to 2 per cent.) or lysol (from $\frac{1}{2}$ to 1 per cent.) to the water. Bichloride of mercury should on account of its poisonous properties be used only in gonorrhœic and syphilitic cases and not stronger than 1 : 2500. As an emollient douches with flax-seed or slippery-elm (a heaping teaspoonful to each quart) are used. In chronic cases vaginal douches are given morning and evening, in acute cases three times a day, or even every three hours.

Intra-uterine injections are much more dangerous than vaginal douches and should always be administered by the physician himself. The patient lies in dorsal position on an inflatable cushion or a rubber sheet. The vagina should be disinfected first. The injection may be given with or without a speculum. If the cervical canal is too narrow to admit the intra-uterine tube, it must be dilated. A double-current tube (Fig. 54) is introduced to the fundus. In order to be sure that the whole interior surface is bathed, it is, however, preferable

FIG. 53.



Fountain syringe.

to use a single-current tube (Fig. 55) made of soft metal, so that it can be given any curvature, or to employ two separate glass tubes; but then the afferent must be thinner than the efferent. The tube is connected with a fountain syringe or irrigator. About a quart of fluid is used in the vagina and from one to three pints in the uterus. After withdraw-

FIG. 54.



Glasgow's double-current intra-uterine tube.

ing the tube, the uterus should be compressed with one hand over the symphysis pubis and one or two fingers introduced into the vagina to remove all fluid. Finally, the vagina is again douched and the perineum drawn back to let the fluid run off. For intra-uterine use creolin is often preferable on account of its antiseptic and hæmostatic qualities, but lysol and carbolic acid have the advantage of making clear solutions. The strength should be about one-half of that used for the vagina. If the patient is anæsthetized it is well to introduce a cervical speculum and insert the single-current tube through that. The intra-

FIG. 55.



Garrigues's single-current soft-metal intra-uterine tube.

uterine injection is used for cleansing and disinfecting the uterus and checking hemorrhage.

Rectal injections, enemas, or clysters are employed for moving the bowels, overcoming an obstruction, marking the course of the intestine, or carrying medicinal substances to its diseased mucous membrane, irrigating it, feeding the patient, or relieving thirst. They are given with a bulb and valve syringe or a fountain syringe, which may be connected with a soft-rubber rectal tube that may give exit to the fluid as high as the splenic flexure of the colon. For irrigation of the lower bowel a double-current nozzle may be used (Fig. 56). The patient should lie on her left side while the fluid flows in. For a common emptying enema she turns over on her back and lies on a bed-pan. When it is of importance that the fluid should reach as high as possible and explosive action of the bowels may be anticipated, it is better

to let the patient remain on the left side, lying on a rubber sheet. Plain cold or lukewarm water may be used, or a heaping teaspoonful

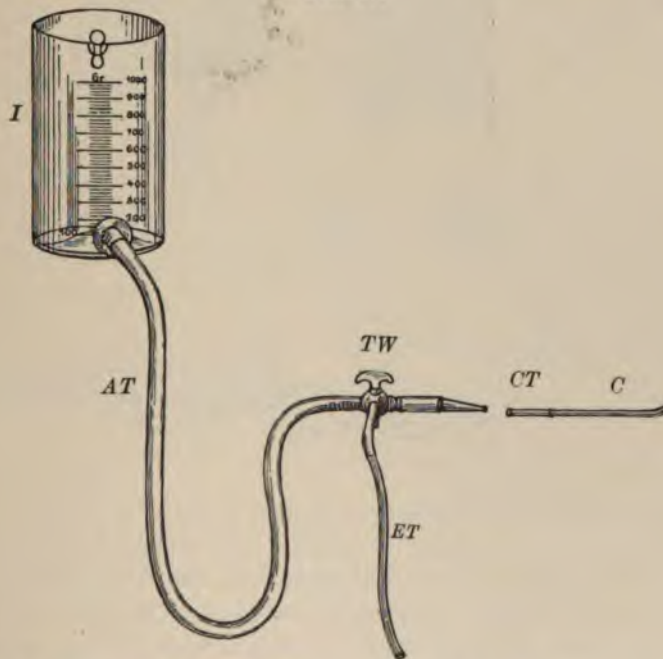
FIG. 56.



Kemp's double-current irrigating nozzle.

of table-salt may be added ; or soapsuds, or a decoction of flaxseed-meal or slippery-elm bark is employed. In obstinate cases an ox-gall enema

FIG. 57.



I, glass irrigator, with scale for 1 litre; *AT*, afferent rubber tube; *TW*, two-way stop-cock, furnishing connection between the irrigator and the bladder or between this and a basin; *ET*, afferent rubber tube; *CT*, connecting rubber tube between nozzle and catheter; *C*, glass catheter.

is more effective than any other fluid (a teaspoonful of inspissated ox-gall is stirred, in a pan, over a fire with a tablespoonful of glycerin ; a

tablespoonful of castor-oil and a teaspoonful of oil of turpentine are added; this is mixed with a quart of flaxseed-tea and a heaping teaspoonful of salt).

Sometimes the patient, although her bowels are open or perhaps even loose, has the sensation that there is something remaining in her rectum, where upon examination a large hard scybalum is felt. Then half an ounce (15 grammes) of glycerin should be injected and the mass broken up and evacuated with the finger and the handle of a tablespoon.

In diseases of the rectum or functional diarrhœa, often astringents or sedatives are injected into the bowel, especially opium, bismuth,

FIG. 58.



Keyes's irrigator for the bladder.

and starch. As in such cases it is desirable that the fluid should be retained as long as possible, the bulk of it should be made small (3iv—120 grammes). The same applies to nutrient enemata, which ought to be limited to 5 or 6 ounces (150 to 180 grammes).

The bowel should be cleansed by a water clyster. An egg beaten up with 4 ounces (120 grammes) of milk and 1 ounce (30 grammes) of whiskey is a suitable mixture for the purpose. Four ounces (120 grammes) of lean beef chopped very fine and mixed with water till the fluid can pass through a Davidson's syringe is still more nourishing. To be retained, fluids should be injected slowly.

The great thirst following most operations may be somewhat relieved by injecting a pint of lukewarm water before the patient is removed from the table, and if she vomits, it may be repeated later. If she is in a low condition, very hot water, about 115° F., helps to rally the flagging spirits.

Vesical injections are a common remedy in bladder disease. The patient should lie on her back on a douche-pan. If the bladder is to be washed out with a copious amount of fluid, this may be administered with an irrigator (Fig. 57), a fountain syringe having a two-way stop-cock (Fig. 58), or with a funnel and rubber tubing, connected with a catheter passed into the organ (Fig. 59). It is best to have a glass irrigator, with engraved scale (Fig. 57). But for use outside of the house, it is

FIG. 59.



Skene's irrigator for the bladder.

convenient to have, instead of this bulky irrigator, a flexible rubber bag, such as Keyes's bladder irrigator (Fig. 58). When the funnel (Fig. 59) is employed and held high, the fluid enters by gravity; when it is lowered, the bladder is evacuated by siphonage. Ordinarily a glass or soft-rubber catheter is used. In order to make connection and disconnection between the tube of the fountain syringe and the catheter

FIG. 60.



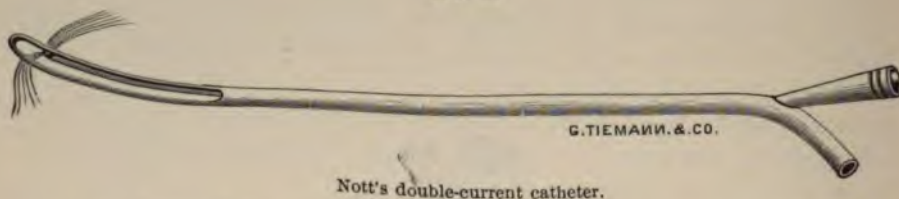
Hard-rubber tube.

easy and painless, a little hard-rubber tube with circular ridges is fitted to the catheter and corresponds in shape to the stop-cock (Fig. 60). If shreds shall be removed, Nott's large-eyed metal catheter (Fig. 61) is preferable. For smaller injections a syringe with piston (Fig. 62) is attached to the catheter. Some prefer to use a glass nozzle, which enters the urethra only very little, and suspend the irrigator so high that the resistance of the sphincter is overcome by gravity.

The fluids most frequently used for washing out the bladder are sterile water or solutions of chloride of sodium (1 per cent.), boric acid (from $\frac{1}{2}$ to 4 per cent.), and nitrate of silver. Tannin (from $\frac{1}{2}$ to 1 per

cent.), carbolic acid ($\frac{1}{2}$ per cent.), and salicylic acid (1 in 1000) are also employed. Creolin ($\frac{1}{2}$ per cent.) and permanganate of potassium (from $\frac{1}{2}$ to 2 per cent.) are less appropriate on account of their color. Nitrate

FIG. 61.



Nott's double-current catheter.

of silver is apt to cause pain, and should, therefore, be used first in a very weak solution (1 in 10,000), gradually increasing the strength to 1 in 1000. The amount of fluid employed for irrigation varies from half

FIG. 62.



Piston syringe.

a pint to a quart; for smaller injections from 1 to 4 ounces. The temperature should, as a rule, be pleasantly lukewarm (98° – 100° F.). Irrigation is repeated daily, or oftener; injection of silver nitrate twice a week.

Subcutaneous and Intravenous Injection.—So-called normal salt solution—that is, a 6 in 1000 solution of chloride of sodium (a flat teaspoonful to a quart of sterile water), or, better,

R Sodii chloridi, 10 grammes ;
Potassii chloridi, 25 centigrammes ;
Calcis chloridi, 10 centigrammes ;
Aque, 1000 grammes.

M.—Sterilize.

is often injected under the skin, *hypodermoclysis*, in order to increase the quantity of fluid circulating in the blood-vessels and thus prevent heart failure. From a pint to a quart is slowly injected in a region where there is much loose connective tissue,—for instance, under the

clavícula,—and to further the absorption the tissue is massaged during the administration. In urgent cases the same fluid may be injected into a vein, generally at the elbow bend. If the abdomen is open it is poured into the peritoneal cavity. The solution should be from 110° to 120° F. It may be introduced by Garrigues's transfusion and infusion apparatus, which has both a canula and a needle (Fig. 63);¹ or for subcutaneous injection the needle may be attached to the tube of a fountain syringe which has been boiled in soda solution immediately before. To obtain more immediate effect and avoid change in

FIG. 63.



Garrigues's apparatus for transfusion and infusion. A, plunger; B, bulb; C, stop-cock; D, needle; E, flexible probe-pointed canula; F, scissors; G, thumb-forceps.

the alimentary canal, remedies such as morphine, atropine, strychnine, etc., are frequently injected under the skin by means of a *hypodermic*, or *Pravaz*, syringe.

C. CURETTAGE, OR CURETTING.—We have spoken above of curettage as a means of diagnosis, and mentioned the instruments used for the purpose; but they are still more frequently used as therapeutic agents. When not surrounded by proper antiseptic and aseptic precautions this seemingly insignificant operation has led to serious pelvic inflammation and death. The patient should occupy the dorsal position on a table, and since the procedure is painful she should, as a rule, be anesthetized. The hair, at least on the labia majora, should be shaved off, and those on the mons Veneris covered with a sterile cloth.

¹ Garrigues, "Apparatus for Transfusion," Amer. Jour. Obst., vol. xi., No. 4, October, 1878.

The vagina should be thoroughly disinfected and the cervical canal dilated. Garrigues's speculum is introduced and the cervix drawn down with a bullet-forceps (Fig. 64). The uterine cavity is irrigated with creolin or lysol. Sims's or Simon's curette is inserted to the fundus and moved down to the internal os. The operator should begin at an easily recognizable point,—for instance, at one cornu,—and go in the same direction all around till he reaches the starting-point, and even repeat this procedure till no more spongy, hyperplastic tissue appears. The fundus should be scraped separately by moving the

FIG. 64.



Bullet-forceps.

curette along it from side to side. In going towards the fundus no scraping should be done, and care must be taken not to perforate the uterus. Should this happen no fluid must be injected. Otherwise the uterus and the vagina are again irrigated, and one or more strips of iodoform gauze are inserted into the cavity to act either as a hæmostatic plug or as a drain, which is diminished with two days' interval and withdrawn on the sixth day. A hæmostatic tampon should be placed in the vagina and removed the following day. If any fever arises, the tampon is at once removed and the vagina douched with antiseptic fluid every three hours. If not, the vagina is only swabbed with the same every day and packed loosely with iodoform gauze. After the final removal of the gauze the antiseptic douche is given twice a day until there is no more discharge. The patient should remain in bed for a week.

D. TAMPONADE.—A tampon is a mass of soft material which is carried into a wound or cavity for the purpose of filling it, so as to prevent hemorrhage, applying drugs to it, or exercising pressure on it.

Pledgets in the Vagina.—Small rolls of absorbent cotton, about $2\frac{1}{2}$ inches long and 1 inch thick, impregnated with some medicinal substance, are applied to the vaginal roof. Around the middle of the tampon is attached a string of strong crochet-yarn, long enough to hang out from the vulva, by which the pledget may easily be withdrawn by

the patient herself or a nurse, and removed. This is done morning and evening, on which occasions the vagina is douched. To combat inflammation the cotton may be moistened with plain glycerin, ichthyol glycerin (5 per cent.), or glycerin with 2 per cent. iodide of potassium and 3 per cent. of boric acid. As an astringent glycerite of tannin (3i to 3i—4 to 30 grammes) is excellent. Others praise boroglycerite or sulphate or acetate of aluminium (3ss to 3i—2 to 30 grammes). All fluids containing glycerin produce a watery discharge, against which the patient may protect her clothes by wearing a napkin or "sanitas pad." If she finds it difficult to introduce the tampon, she may avail herself of Robert Barnes's tampon-speculum (Fig. 65).

Packing of the vagina combines the application of medicated pledgets with mechanical pressure. The patient is placed in knee-

FIG. 65.



Robert Barnes's tampon-speculum.

chest position, Sims's speculum is introduced, a pledget soaked in the above-mentioned solution of iodide of potassium is applied to the vaginal vault, and the whole vagina is packed with tampons of dry cotton to the entrance. After thirty-six hours the tampons are removed by a nurse and the vagina is douched. This "columnizing" may be repeated two or three times a week. In this way the uterus is raised, adhesions stretched, cicatrices softened, exudations absorbed, and congestion relieved.

The Hæmostatic Vaginal Plug.—A well-made tampon is one of the surest means of arresting uterine hemorrhage, but for this purpose it must literally fill the vagina from the roof to the entrance. In a woman who has borne children a dozen tampons of the size of hen's eggs may be required. Two sheets of absorbent cotton, a foot square, are immersed in an emulsion of creolin, 1 per cent., and torn into long strips, which are folded so as to make small squares, and squeezed dry. The patient is placed in Sims's position and the vagina swabbed. A pledget is placed with a dressing-forceps in front, behind, and on either side of the cervix; and then the whole vagina is filled tightly with the remaining tampons. In most cases it suffices to pack the vagina, but when the hemorrhage is serious, also the vulva should be

distended with tampons and two tightly-rolled towels applied cross-wise in front of it and kept in place with a double-tailed T-bandage, the tails being crossed over the tampon and fastened to the bandage surrounding the pelvis. In such cases it is well also to wring the upper pledgets out of diluted liquor ferri chloridi (1 part to 10 parts of water). Instead of cotton, pieces of iodoform gauze, 1 foot wide and 2 feet long, folded to a width of 2 inches, may be used. This works somewhat as a drain, but is on account of its meshes less reliable for a hæmostatic plug than cotton batting. The cotton must be removed, and if necessary renewed within twenty-four hours, while iodoform gauze may remain for five or six days if no blood oozes through it. Gauze may simply be withdrawn by pulling at the end, but to remove the cotton tampons the patient is again placed in Sims's position and Sims's speculum gradually inserted deeper and deeper, while the pledgets are withdrawn with a dressing-forceps.

Tamponade of the Uterus.—The cavity of the uterus may be tamponed for arresting hemorrhage, for carrying medicinal substances to the mucous membrane, and for draining the organ or its appendages. It is done with a strip of iodoform gauze, 2 inches wide, folded twice lengthwise. Even in a nulliparous womb a small strip may be introduced. The insertion is made with a fine forceps. For the undilated cervix it must be curved (Fig. 66); but generally the cervix is dilated,

FIG. 66.

Garrigues's curved intra-uterine packing forceps.¹

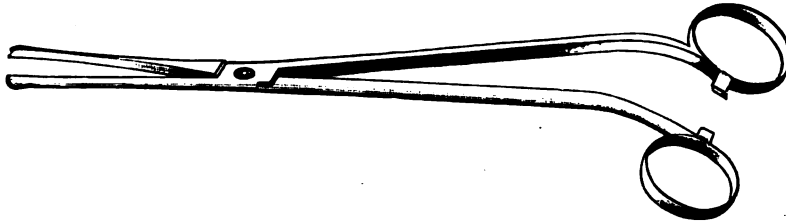
and often curettage precedes the tamponing. If the gauze is brought in through a cervical speculum, the forceps must be straight (Fig. 67).

Abdominal Tampon.—After laparotomy there is sometimes an oozing of blood, which may be checked with a *Mikulicz tampon*. To a

¹ Garrigues, "Intra-uterine Packing Forceps," Amer. Jour. Obst., 1892, vol. xxv., No. 1.

piece of iodoform gauze, about half a yard square, is fastened in the middle a strong silk thread. The gauze is applied to the bleeding region with the two ends of the thread turned inside, but left long enough to reach out of the pouch formed by the gauze, which is filled with strips of the same material. The edges of the gauze and ends of the strips are left hanging out through the lower part of the wound

FIG. 67.



Garrigue's straight intra-uterine packing forceps.

where the sutures are not tied. The following day the tampon is removed by pulling separately on each strip and finally on the thread. Sometimes the abdominal tampon is combined with one in the vagina.

E. HÆMOSTASIS.—Besides the tampon and hæmostatic drugs, there are many other means of checking hemorrhage,—*hot water, styptics, cauterization, ligature, suture, and forcipressure.*

Hot water, either as plain sterile water, normal salt solution, or mild antiseptic solutions, is used for irrigating the field during operation or for arresting oozing of blood. It is often poured from a pitcher into the peritoneal cavity; but there it is better to let it run in through a glass tube, thick as a finger, which can be introduced into the deepest recesses, where otherwise blood-clots or other material may remain. We have seen above that hot water is used also for vaginal and intra-uterine hæmostatic douches.

Styptics, such as tannin, alum, liquor ferri chloridi, and Monsell's solution, are applied undiluted to small bleeding surfaces or are used, diluted with eight or ten parts of water, on tampons. They may be employed also for injections, but should then be diluted much more, as described above. Ferripyrin may be used for application as a powder or in a 20 per cent. solution. Styptic cotton, made either with tannin or chloride of iron, is often a convenient hæmostatic for small bleeding surfaces.

Cauterization is an important way of arresting hemorrhage, and was before the invention of the ligature the chief one. It is at the

same time a powerful antiseptic, but, like styptics, it prevents healing by first intention. The apparatus generally used nowadays is that of Paquelin (Fig. 68), in which platinum points of different shape can be kept at a variant degree of heat by means of benzin vapor.



Paquelin's thermocautery. *A* and *B*, platinum points; *C*, middle piece; *D*, handle containing benzin; *E*, air-chamber; *F*, air-pump.

The *Galvano-cautery* has been described under electric treatment.

Vaporization, or Atmocausis.—Steam may be used as hæmostatic, and is under circumstances—*e.g.*, on the liver or spleen—preferable to any other cautery. The steam is produced in a kettle and led through a rubber tube and a metal catheter with several small holes to the place to be vaporized, commonly the uterine cavity. The catheter should be withdrawn from $\frac{1}{4}$ to $\frac{1}{2}$ inch from the fundus, so as to prevent perforation when the uterus contracts under the influence of the hot vapor. The exposure should ordinarily be only from $\frac{1}{4}$ to $\frac{1}{2}$ minute; but if the object is to destroy the uterine cavity, which has been done for hæmophilia and for climacteric hemorrhage, it should be two minutes, and must, perhaps, be repeated. The steam should have a temperature from 100° to 115°C . The patient should be in dorsal position, but need not be anæsthetized for a short operation which is not very painful. Garrigues's weight speculum is introduced to give access to the os. The cervix should be dilated, and for its protection a rubber sheath should be placed around the proximal part of the catheter. The apparatus generally employed is that of Pincus (Fig. 69).

In order to prevent accidental closure, a uterine sound should be introduced once a week during the healing process, which takes up to four weeks. On account of inherent danger, the method should not be used if simpler remedies suffice; but, on the other hand, by its employment many a uterus may be saved which otherwise would be extirpated. It is contraindicated when there is acute or subacute inflammation of the appendages. The patient should remain in bed

while the eschara is thrown off, which takes from three to seven days; and as long as there is any discharge, antiseptic vaginal injections should be used.

FIG. 69.



Pincus's vaporizer.

Ligature.—Arteries or, more rarely, veins are tied with silk or catgut, either at the cut-end or in continuity. As far as possible the vessel alone is surrounded by the ligature, but in gynecic operations one is oftener than in general surgery compelled to embrace more or less of the adjacent tissue (*mass ligature*). If the vessel cannot be isolated, it is often necessary to carry the ligature around it with a needle, which is called *circumvention*.

Ligature of the Uterine Artery.—The uterine artery may be reached from the vagina or from the abdomen. *Vaginal route:* the patient is placed in dorsal or breech-back position, Garrigues's weight speculum is introduced and then an anterior blade, so as to expose the whole vaginal vault well. A strong thread is carried with a curved needle through both lips of the cervical portion* in the median line. Before

tying it a strip of iodoform gauze may be inserted into the cervical canal to keep discharge from this organ away from the wound. By means of this guy the uterus is drawn down and over to the side opposite to that where we wish to ligate the artery, and the anterior blade is removed. The lateral vault of the vagina is exposed with a retractor (Fig. 70). A fold of the vaginal roof is lifted with a tenacu-

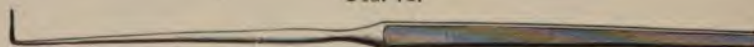
FIG. 70.



Schroeder's vaginal retractor.

lum (Fig. 71) about $\frac{3}{4}$ of an inch outside of the uterovaginal junction and incised in an anteroposterior direction with a pair of blunt-pointed scissors curved on the flat (Fig. 72). Next, one blade is inserted under the vaginal vault and the incision elongated forward and backward

FIG. 71.



Tenaculum.

in a curved line with the convexity turned outward, until it measures from $1\frac{1}{2}$ to 2 inches. With both index-fingers the vagina is separated from the parametrium to the extent of nearly 2 inches. In a similar manner the parametrium is liberated from the bladder and ureter in

FIG. 72.



Curved, blunt-pointed scissors.

front and the rectum behind, and can then be seized between the thumb and index. The main trunk of the uterine artery and branches are felt pulsating. A silk ligature is carried with a Schroeder needle (Fig. 73) from behind forward over the whole parametrium, tied and cut short. This ligature should be placed as far out to the side as

possible, to include as many branches of the artery as feasible. Finally, the edges of the wound are united with a running catgut suture (Fig. 74) and the vagina is packed loosely with iodoform gauze.

Abdominal ligation of the uterine artery necessitates laparotomy

FIG. 73.



Schroeder needle.

and will be considered later. The same applies to the ligation of the internal iliac artery and the ovarian vessels.

The *internal pudic artery* is reached when it bleeds in the perineum by an incision parallel to the ascending ramus of the ischium and the descending one of the pubis. Both ends must be tied.

Sutures are frequently used for hæmostasis,—for instance, a running suture is placed along the upper edge of the broad ligaments after removal of an ovary or the extirpation of the uterus. Often a suture is passed in the shape of a figure of eight under some oozing point of the peritoneum. We have also mentioned that a retracted artery is secured by passing a thread around it with a needle comprising the adjacent tissue. If a part of the abdominal wall has become denuded of peritoneum, it may be folded and so-called *mattress sutures* put through from side to side, which may be made still more effective by applying sticks, such as lead-pencils or pen-holders, under the sutures before tying them—*quilled suture*.

FIG. 74.

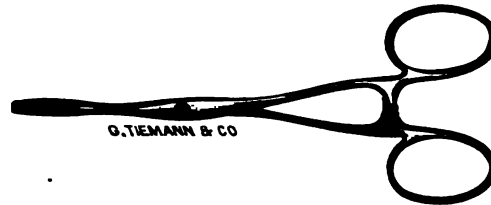


Vaginal ligation of uterine artery. *a*, cervical portion; *bb*, incisions closed by suture.

Forcipressure.—Much time may be saved in operations by applying forceps with racks instead of ligatures. The method has also the advantage that it can be used where there is not room or tissue enough to employ ligatures. The pressure can likewise be employed temporarily and a ligature substituted later in the operation,—for instance,

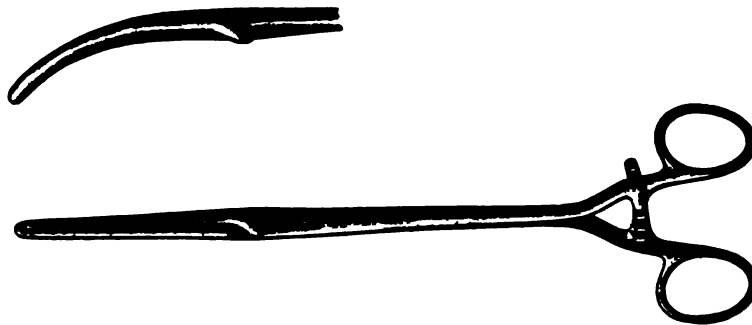
after the removal of a tumor has made the area more accessible. For a single artery a small artery-forceps (Fig. 75) is used; for more extended masses of tissue, such as the broad ligaments, the parametrium, or the pedicle of a tumor, long and strong forceps with longer

FIG. 75.

Péan's artery-forceps.¹

or shorter jaws are required (Figs. 76, 77). A long-jawed forceps should be made so as to close from the point backward. Otherwise the compression becomes uneven and unreliable. These strong pressure-forceps, which, for instance, are applied in vaginal hysterectomy,

FIG. 76



Péan's compression-forceps with long jaws, straight or curved.

should be left in place for forty-eight hours. Their removal is quite painful.

Angiotripsy.—The principle of compression is carried to its extreme in the angiotribe (Fig. 78), a powerful forceps by which the artery and the surrounding tissue are crushed, so that there is no bleeding, and no foreign body—ligature or clamp—is left in the wound.

¹ Koeberlé, of Strasbourg, was the inventor of the principle and constructed the first instrument with three holes instead of the rack. Later it was modified, and the different special forms are known as Péan's, Spencer Wells's, Tait's, etc.

F. DRAINAGE.—Perforated glass *stems*, with a plate fitting the vaginal portion (Fig. 79), are sometimes left in the uterine cavity to allow

FIG. 77.



Péan's compression-forceps with short jaws.

menstrual blood or other discharge to find an exit. After curetting often an *iodoform gauze* drain is left in the uterus. Similar drains are

FIG. 78.



Tuffier's angiotribe.

often led out from the abdominal cavity through the wound in the wall or through the vagina. Soft-rubber tubes are also used under these circumstances, if there is no hemorrhage to be checked. A single tube with side-holes may be drawn through a cavity, —*e.g.*, from the region above Poupart's ligament to the vagina and out through the vulva. In a cavity with only one outlet it is better to employ a double tube with cross-bar (Fig. 80). One of the tubes has side-holes, the other not. In a large cavity it is best to use the sky-rocket drain (Fig. 81), consisting of a short, thick, and stiff tube with side-holes and

FIG. 79.



Perforated stem-pessary.

a long, thin tube. The former is fastened with four silkworm or silver sutures to the edges of the wound in the vaginal vault, while the latter extends beyond the vulva and is used for injecting antiseptic fluid.

The opening for this drainage-tube is made by incising the vaginal

FIG. 80.



Double drainage-tube with cross-bar.

vault transversely or longitudinally behind the cervix, separating the tissues bluntly, and perforating the abscess with a blunt expanding perforator (Fig. 82). If a still larger opening is desired, this instrument is followed by Bischoff's vaginal speculum (Fig. 83) used as a dilator.

Opinions differ very much among gynecologists in regard to the

FIG. 81.



Sky-rocket drainage-tube.

value of prophylactic drainage after operations. In a general way it may be stated that the more perfect asepsis is, the less drainage is needed, and any kind of drain is a foreign body that causes irritation.

G. BLOODLETTING.—Local depletion is in some cases an efficient remedy to combat congestion or chronic inflammation of the uterus or

FIG. 82.



Garrigues's blunt expanding perforator.

appendages. *Leeches*, three or four in number, may be applied around the anus or the os. In the latter place they are let in through a Fergusson speculum, and to prevent their crawling into the uterus the cervical canal should be blocked with a little gauze. This method is

little used here. Blood may be drawn with an artificial leech, a syringe with a spear (Fig. 84). But the simplest and best is to use a scarifier (Fig. 85). The little spear is pushed from $\frac{1}{2}$ to $\frac{3}{4}$ of an inch into the cervix in three or four points, preferably the posterior lip, which is

FIG. 83.



Large blunt pelvic dilator. (Bischoff's vaginal speculum.)

less sensitive, and from half an ounce to one ounce is withdrawn twice a week. The patient is placed in left-side position and a bivalve speculum introduced. If the flow does not stop of itself, a little cotton dipped in cold water is pressed against the bleeding openings, or they

FIG. 84.



Reese's uterine leech. By pressure on *A*, the spear is made to protrude more or less, the penetration being checked on the wheel, *a*, moving on the rod *B*. By pulling on *C* the piston is drawn back, producing a vacuum in the glass cylinder *C*.

are touched with liquor ferri chloridi, or if in very rare cases that does not arrest the bleeding, a hot douche is given.

H. HEAT AND COLD.—Hot and lukewarm injections and the use of hot water as hæmostatic have been referred to above. A flaxseed-

FIG. 85.



Garrigues's uterine scarifier.

meal *poultice* has a soothing effect. Sometimes a double piece of flannel wrung out of hot water—or so-called *stupe*—is substituted. It may be rendered more efficacious by sprinkling it with laudanum or spirit of turpentine. These warm applications should be covered with some waterproof material and woollens. *Spongiopilin* combines the stupe and waterproof in one, being felt doubled by a layer of gutta-percha.

Rubber bags filled with hot water are extensively used as a house remedy. *Antiphlogistin* is a putty-like salve, which is warmed, smeared on the skin, covered with cheese-cloth, and kept in place with a bandage. It is renewed only once in twenty-four hours, and relieves œdema and inflammation.

Hot air is also effective in resolving exudations, but necessitates a special apparatus, wherefore it is less available in private practice.

Cold is not less valuable than heat; for certain conditions even more so. An *ice-bag* or a rubber coil through which runs ice-water, applied to the abdomen, combats pain more successfully than warm applications and effects a speedier cure. To prevent local freezing, four layers of muslin should be placed between the skin and the bag. A *Priessnitz* pad is a towel wrung out of cold water. When applied to the skin and covered with waterproof material it becomes warm in a quarter of an hour. It is renewed every six hours. The alternation between cold and heat furthers absorption.

Baths.—A warm general bath of about blood-heat is very soothing for the nerves and keeps the skin in good condition. It should be taken twice a week for ten or fifteen minutes. *Sitz baths* of 110° F. may be taken with advantage once a day for ten minutes to relieve pain in the bladder and other pelvic organs. *Turkish* and *Russian baths* are particularly indicated in rheumatic patients. A *hot-air bath* may be improvised by placing an alcohol lamp under a chair, an open umbrella over the patient lying in bed, and covering all with waterproofs and blankets; or she may sit on the chair. A *hot pack* may be used to produce perspiration; but as it is weakening, it should not exceed two hours in duration. *Sea baths* are a powerful agent against hemorrhage and leucorrhœa. *Shower baths*, *sponge baths*, *towel baths*, *sheet baths*, and a complete *hydriatic treatment* are all nerve tonics. *Cold packs* and *cold baths* are used for reducing temperature. Franzensbad, Ems, Kreutznach, and Plombières are much recommended by European physicians. Kreutznach has a special reputation for chronic metritis and myoma of the uterus. Artificial Kreutznach baths may be made by mixing the salts and mother-lye¹ with common water.

I. COUNTERIRRITATION draws blood away from deep inflamed parts, relieves pain, and furthers absorption. *Tincture of iodine* is painted once a day on the abdomen, and when the skin begins to crack, it is covered with a pad soaked in a lotion containing carbolic acid (2 per cent.) and glycerin (12 per cent.). The vaginal vault may be painted

¹ Sold by Filibert Korndörffer, 666 Lexington Avenue, New York.

twice a week. Small *fly-blisters*, from 2 to 4 square inches, are sometimes applied every evening to the inguinal and iliac regions.

J. TAPPING AND ASPIRATION.—We have already spoken of aspiration of fluid for diagnostic purposes; but it may be used also for treatment,—*e.g.*, for drawing out the serum collected under false membranes in the pelvis. During laparotomies it is sometimes used to evacuate a fluid from the tube or broad ligament. Tapping of tumors is rarely used, except during ovariectomy to diminish the cyst; but ascitic fluid must often be given an outlet by means of a trocar and canula. The patient should lie on her side or sit on a chair. The bladder should be emptied with a catheter. A sheet should be passed around the abdomen above and below the point to be punctured, which is in the median line midway between the umbilicus and the symphysis. The ends of the sheet are crossed and pulled upon by an assistant, not

FIG. 86.



Curved trocar with canula.

only to press the fluid out, but to prevent a sudden rush of blood to the abdomen, by which an anæmia of the brain and heart-failure may be induced. If a large trocar is to be employed, it is best to anæsthetize the skin with ethyl-chloride or the hypodermic injection of a quarter of a grain of cocaine and make a longitudinal incision large enough to admit the trocar. After the operation the edges of the wound are drawn together and covered with adhesive plaster, preferably aseptic oxide-of-zinc plaster. Sometimes a curved trocar (Fig. 86) is needed.

K. ABDOMINAL SUPPORTERS.—Abdominal belts often give great relief by lifting the abdominal organs and diminishing pressure on the uterus and appendages. The best is Teufel's (Fig. 87). Some women need a stronger local pressure,—*e.g.*, to hold up a myomatous uterus. Then the so-called "natural body brace," with its large perforated, nickel-plated, hypogastric pad (Fig. 88), answers well.

¹ Natural Body Brace Company, National Hotel Block, Salina, Kansas.

L. MASSAGE.—Pelvic massage may with advantage be employed to reduce enlargement, replace organs, strengthen muscles and ligaments, cause absorption, etc. The procedure being rather painful, there is no danger of causing sexual excitement. One or two fingers are held quietly in the vagina, while the other hand grasps organs or tissues

FIG. 87.



Teufel's abdominal supporter.

and presses them against the vaginal finger. The procedure is repeated three times a week, for ten minutes. If there is an accumulation of blood or pus in the Fallopian tube, local massage is contraindicated, since the fluid might be forced into the peritoneal cavity.

FIG. 88.



Nickel-plated, perforated, hypogastric pad, forming part of "natural body brace."

General massage is often valuable as a hypnotic, to reduce obesity, to combat constipation, or relieve pain.

M. GYMNASTICS.—Regulated muscular movements may be used both as preventive and as an after-treatment. The *Swedish movement cure* is a scientific combination of active and passive movements, which

is well appropriated in diseases of women accompanied by great debility. For the strong and healthy bicycling is excellent.¹

N. OPERATIONS IN GENERAL.—1. *Time for Operating.*—The seasons have no appreciable influence on the result of operations, but respect for the patient's comfort recommends in cases of choice to avoid the hottest months of the year.

As far as possible operations during *pregnancy* should be avoided on account of the danger of provoking abortion; but sometimes the very pregnancy offers the indication for operating. Thus in ectopic gestation, the sooner the case can be operated on the better. In carcinoma of the cervix, if discovered in time, total hysterectomy is performed. Later cervical Cæsarean section is done, followed by extirpation of the uterus. A polypus of the cervix, if large enough to obstruct the parturient canal, should be removed. An ovarian cyst should in early pregnancy be extirpated; towards its end or during labor, tapping may be preferred, if much space can be gained by it. For severe vomiting, the distention of the lower part of the cervix with the index-finger sometimes gives relief.

Menstruation deserves also consideration. Plastic operations should always be performed shortly after the period, so as to have the wounds healed before the next appears. Operations on the uterus had better be postponed on account of the greater determination of blood to the pelvic organs. In ovariectomy and oöphorectomy the catamenia are of minor importance. But if the case is not urgent, all operations, even vaccination, should be avoided during the menstrual flow with its congestion and nervous excitability.

Lactation does not interfere with operations, so far as the mother is concerned. But if general anæsthesia is produced, the child should not nurse for twenty-four hours, but have some artificial food; and the milk should be milked or pumped out of the woman's breasts and thrown away.

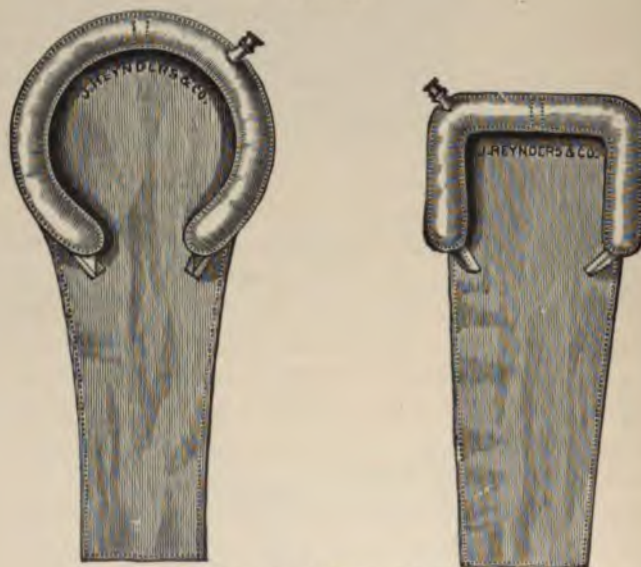
In regard to the *hour*, the morning is the best time, when the operator is sure not to have seen any infectious case. At all events, if feasible, daylight should be preferred; but if it is necessary to operate at night, the best possible light, preferably electric light, or gas-light with Welsbach mantels, should be provided and arranged so as to come from different sides.

2. *Preparations for Operations.*—*Room.*—If possible two rooms should be used, one for the preparation inclusive of anæsthesia and

¹ Garrigues, "Woman and the Bicycle." The Forum, January, 1896.

for the after-treatment, the other for the operation proper. A well-lighted room should be chosen for the operation, that for the after-treatment should be airy and cheerful, cool in summer and not cold in winter. The day before the operation all superfluous furniture should be removed from the operating-room, the carpet torn up, and the floor scrubbed with soap and water, followed by a solution of bichloride of mercury (1 : 1000). Dust should be removed with a moist cloth and the room aired. The temperature should be 70° F., or for laparotomies 80°. The bed should be accessible from both sides and

FIG. 89.



Inflatable rubber cushions with aprons.

the foot. It should not have curtains. It should have an upper horse-hair mattress and a lower woven-metal spring mattress. The patient should be covered with blankets. If possible it should be a single bedstead; but it is a great advantage to have two in the same room, not only for the comfort of the nurse, but for the patient herself.

Table.—In private practice a common kitchen-table, four feet by two, forms an excellent operating-table. It should be covered with blankets or quilts, a sheet of rubber or oil-cloth, and a muslin sheet. The waterproof sheet is for vaginal operations pinned together so as to form a funnel leading to a slop-pail at the foot of the table. For

ovariotomy it is more convenient to have the pail under the table at the side where the operator stands. Instead of the rubber sheet, an *inflatable rubber cushion* (Fig. 89) may be used or a similar contrivance made by rolling a long towel or a small sheet together so as to form a cylinder and bend it in a circle or the three sides of a square, tying the two corners with cord. Around this is folded a piece of rubber sheeting or oil-cloth and one end is allowed to hang down as an apron. In hospitals tables made of enamelled iron and glass with adaptable uprights and stirrups for suspending the feet and a rack for elevating the pelvis are used (Fig. 5). The latter may be fairly well done by

FIG. 90



Elevated-pelvis position on an inverted chair.

placing the patient on an inverted chair (Fig. 90), which is padded and to which the knees are tied under a right angle. A small table should be provided for the anæsthetist and a larger one for instruments and dressings.

Assistants.—For most operations three or four assistants are needed, each of whom should be instructed beforehand about his particular duties. One should exclusively attend to the anæsthesia and pay no attention whatsoever to the operation, inspiring himself with the dignifying thought that the patient's life depends more frequently on him than on the operator. One hands instruments, unless the surgeon prefers to take them himself. In vaginal operations one or two are

needed, one on either side of the field. In laparotomies one stands opposite to the operator and another at his left side. A nurse should attend to fluids and sponges. None of the participants in an operation should recently have seen a patient affected with erysipelas, puerperal sepsis, diphtheria, or scarlet fever. No loud talking or laughing should be tolerated, and if any of those around the patient must cough or sneeze, they should turn away from the patient, experiments having shown that pathogenic microbes may in this way be carried and cause infection at a distance of several yards.

Patient.—The *urine* should be examined chemically for albumin and sugar, and microscopically for casts, epithelial cells, and pus. In acute inflammation of the urinary organs the operation should be postponed until the complication is cured; in chronic affections chloroform should be preferred to ether for anæsthesia, or the operation be performed under local or medullary cocainization, opium, or without an anæsthetic, or perhaps given up altogether. If the urine is loaded with pigment and salts, it should be diluted by prescribing Poland water, Buffalo lithia water, or similar diuretics. If it contains sugar, the patient is unfit for a plastic operation. *Heart and lungs* should be examined. In heart disease chloroform is more dangerous than ether, while in affections of the air-passages the latter is too irritating and cold. Advanced phthisis is a counterindication for nearly all operations.

On the preceding day the patient is given a warm bath, to which a handful of soda may be added advantageously, and she is scrubbed thoroughly with soap. To empty her bowels, she should in the evening take a heaping teaspoonful of compound licorice powder or two heaping teaspoonfuls of sodium sulphate; and six hours before the operation a quart of soapsuds should be administered as an enema. For a laparotomy the abdomen and genitals should be shaved and the former covered with a pad smeared with potassa soap. After twelve hours this is washed off and a pad soaked in a solution of bichloride of mercury (1:2000) substituted and covered with sheet rubber, which is kept in place with a roller bandage and left on till the time of the operation. For most operations the pubic hair is shaved off. In timid and nervous patients it is, however, often preferable to postpone all shaving until they are unconscious. It is well to give a hypodermic injection containing $\frac{1}{8}$ grain (1-centigramme) of morphine twenty minutes before anæsthesia is begun. It tranquillizes the patient and diminishes the amount of anæsthetic required. The patient should be in night dress, with long stockings, but the gown should be removed before she is placed on the

table. When she is unconscious the undervest is turned over the arms on the chest and pinned above them. Leggings of Canton flannel keep the lower limbs warm. Immediately before the operation the bladder is emptied with a catheter and the vulva and vagina disinfected by pouring *tinctura saponis viridis* into them and rubbing them with gauze pads held in a forceps. Then they are irrigated with corrosive sublimate solution from a pitcher, and finally with lysol, which restores the natural softness and smoothness of the surface. For a laparotomy the abdomen is scrubbed with soap and a brush and washed with corrosive sublimate and alcohol. The field is covered with a sterile cloth with a slit in the middle.

For vaginal operations the knees are brought up and held with a *leg-holder* (Fig. 91). It is hitched around the lower part of the right thigh and passed under the back to the left shoulder, which should be well padded with cotton. Next it is carried in front of the shoulder and made to surround the left thigh.

Vessels and Towels.—Two instrument-trays of glass, china, enamelled iron, or hard rubber; four plates for ligatures, sutures, gauze, and gutta-percha tissue; four basins; four pitchers with hot water, cold sterile water, normal salt solution, and corrosive sublimate solution; two fountain syringes or douche-cans with straight glass nozzles, six inches long; and a hard-rubber nozzle with stopcock easily

FIG. 91.



Robb's leg-holder.

FIG. 92.



Nozzle with stopcock.

moved by the thumb (Fig. 92), should be prepared. At least a dozen towels will be needed in a major operation.

Disinfection, Asepsis, and Antisepsis.—In hospitals and as far as possible in private houses the rules of aseptic and antiseptic surgery should be followed. All utensils used should be boiled or thoroughly washed with bichloride of mercury solution. The general practitioner may save a great deal of money and do just as good work by using

objects made for other purposes and found at small cost in common stores instead of the costly apparatus sold by instrument-makers. Thus an agateware asparagus-boiler or fish-kettle is excellent for boiling instruments. Small plates of the same material and glass trays and bowls are convenient for ligatures, etc. A large-sized Arnold milk-sterilizer may be employed for sterilizing sponges, towels, gowns, caps, etc.

Instruments are boiled for five minutes in a solution of washing-soda (a tablespoonful to each quart of water). Knives and needles should be wrapped up in gauze, so as not to be mechanically injured. Gauze pads, towels, gowns, and caps are disinfected by being penetrated by moving steam for an hour. In hospitals special sterilizers in which the steam is overheated are employed. In private practice all material may be brought sterilized to the place of operation, or it may be disinfected in one of the following ways. Four bricks are raised on their long edge in a boiler containing water up to three-fourths of the height of the bricks and standing over a brisk fire. On the bricks is placed a colander, into which are laid sheets, towels, and dressings, each rolled up separately. Next, the boiler is tightly covered and the contents steamed for an hour, when the colander is put in a warm oven for fifteen minutes to dry the linen without scorching it. If there is not sufficient time for the steaming process, the towels, etc., may be placed in a boiler or covered dish-pan and boiled for fifteen minutes. If there are no facilities for boiling, the material may be soaked in a solution of corrosive sublimate 1 : 1000 or carbolic acid 1 : 20 for one or two hours.

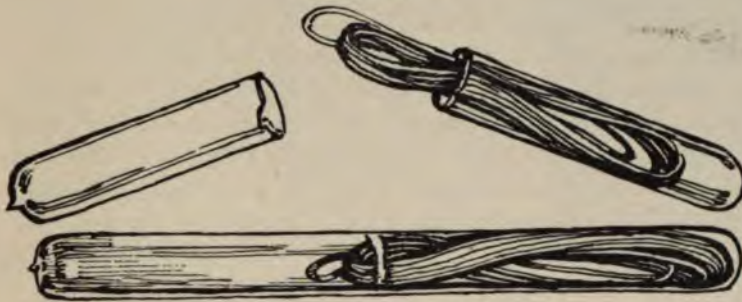
The operator and his assistants should take off their coats, collars, neckties, and cuffs, and roll up their sleeves over the elbow, scrub their hands and arms with potassa soap and water as hot as they can bear, and scrape their nails with a steel scraper. Next they should scrub their hands in corrosive sublimate solution (1 : 2000), then immerse them in lysol solution (1 : 100), and finally rub them with a rag soaked in alcohol. This process takes from six to ten minutes. It is convenient for the operator to have a rubber apron covering him from the neck to a little above the ankles, and he and those assisting him must have sterilized gowns and caps or at least a towel wrung out of carbolized water pinned to their aprons. Some operators use also rubber gloves, but they interfere seriously with delicate touch, and many have given them up or never adopted them. It is best to have a separate knife for the skin, as the deeper parts of the cutaneous glands contain microbes which cannot be removed in any way.

Dressing, ligature, and suture material are now found perfectly

aseptic in the stores. Clinical experience combined with laboratory investigations has proved that only one kind of *catgut*—namely, that prepared with cumol—is absolutely reliable (Fig. 93).¹

It is a great advantage to use absorbable ligatures, but for certain purposes *silk* is better. *Silkworm gut* should also be on hand. *Silver*

FIG. 93.



Glass tubes containing aseptic ligatures.

wire is used less nowadays than formerly, but is the best suture material for certain purposes. It may be made aseptic by boiling it with the instruments or drawing it through the flame of an alcohol lamp and keeping it immersed in alcohol.

Antiseptic Fluids.—*Corrosive sublimate* is a strong poison, and its indiscriminate use has cost many lives.² It is better not to use it on wounds and in cavities, especially not on pregnant women and puerperæ; but for the skin of the doctor and patient it is the most effective. It is convenient to have a standard solution of 1:1000, which is diluted with warm water. *Sublamine* is a combination of mercuric sulphate and ethylene-diamine that does not irritate the skin. It comes in form of easily dissolvable tablets and is used in the strength of 1:1000 (one tablet to each quart of water). *Carbolic acid* is also a poison and not germicidal in less than a 2 per cent. solution. *Creolin* forms an opaque whitish emulsion. As a rule, it is used in a strength of 1 per cent. It has hæmostatic power and makes the tissue smooth and soft. *Lysol* forms a nearly clear greenish mixture with water, and is good for injections, but not for operations, as it becomes black by being mixed with blood, foams, and makes hands and instruments

¹ Such catgut is sold by Van Horn & Sawtell, 507 Madison Avenue, New York.

² Garrigues, "Corrosive Sublimate and Creolin in Obstetric Practice," Amer. Jour. Med. Sci., vol. xcvi., August, 1889.

too slippery. *Thiersch's solution* (Ac. salicyl. 2, ac. borici 12, aquæ destillat. 1000) is so bland that it may be used in the peritoneal cavity or for irrigation of wounds. The solution may be made by dissolving one of Thiersch's tablets in a quart of water.

Sterilized water is made by boiling water for five minutes. It should be made fresh every day. It is used for irrigation of wounds, keeping instruments during the operation, and wetting pads; but it becomes so full of microbes from the skin of the hands dipping into it that it may be safer to come back to antiseptic fluids, or the assistants must wear rubber gloves. *Normal salt solution* (p. 62) is used for pouring into the peritoneal cavity and subcutaneous and intravenous injection.

Real *sponges* are so hard to disinfect that they have been replaced by *gauze pads*. These measure from 2 to 6 or 8 inches square and have from 4 to 6 layers. The smaller ones, used for mopping, are usually called sponges. The largest are used for protection against contamination or for keeping back the intestines in laparotomy.

3. *Anæsthesia*.¹—The chief anæsthetics are ether and chloroform, of which ether as the safer should be preferred, except in patients affected with inflammation of the air-passages, the kidneys, or the brain. But some patients take better one of the two than the other. The mixture of both and alcohol—the so-called A. C. E. mixture—has given still better results than either of them used alone (℞ Alcohol absoluti, 3i—30 grammes; chloroformi purificati, 3ii—60 grammes; ætheris fortioris, 3iii—90 grammes). The so-called *gas-ether method* is much used by special anæsthetists. By inhalation of nitrous-oxide gas the patient is made unconscious almost instantaneously, and thereafter anæsthesia is kept up with ether.

Both ether and chloroform cause in protracted operations acute nephritis with albuminuria and casts. Either of them brings the patient to the verge of death. The anæsthetist should, therefore, pay his undivided attention to the patient, be on the lookout for danger-signs, and be prepared to meet accidents. With ether the respiration, and in giving chloroform the pulse, should be especially watched. Great care should also be taken not to produce pressure paralysis² by letting the arms hang down on the sides of the table, exposing the legs to pressure against the leg-holder, or lifting the arms above the head, whereby the brachial plexus is compressed between the collar-bone

¹ Garrigues, "Clinical Observations in Regard to General Anæsthesia by the Schleich Mixtures," Med. News, November 12, 1898; January 7, 1899.

² Garrigues, "Anæsthesia Paralysis," Amer. Jour. Med. Sci., January, 1897.

and the first rib. All bands should be loosened and the chest made easily accessible. False teeth should be removed.

For a serious operation it is well to have a pound of ether in readiness, but divided in cans of a hundred grammes. Of chloroform four fluidounces are sufficient. Ether is administered with Allis's inhaler (Fig. 94) or an improvised cone made of a towel and a newspaper. Chloroform is given with Esmarch's mask (Fig. 95).

The vapor of ether being inflammable, care should be taken not to approach the inhaler or can too near a gas-flame, an open fire, or a cautery. A yard's distance offers ample security. At first only a few drops should be sprinkled on the folds of the inhaler, then a few more, after from half a minute to one minute; when deep inspirations are made a little stream may be poured on, and when the patient has become tolerant, as much as can be evaporated. In this way the patient is brought completely under the influence of the anæ-

FIG. 94.



Allis's ether inhaler.

FIG. 95.



Esmarch's chloroform mask.

thetic in from five to ten minutes, and a slight dripping suffices to keep up the effect.

Of chloroform from 8 to 10 drops should be dripped on the mask

collapses under chloroform, a combination of Nélaton's and Silvester's methods is the best: she should be held at the end of the table, head downward, which brings the blood back to the brain, and simultaneously artificial respiration should be instituted by alternately extending the upper extremities at the sides of the head and pressing the flexed elbows against the thorax. If there has been much loss of blood, an intravenous injection should be given with normal salt solution, which in less urgent cases may be injected under the skin. Koenig's method consists in rapidly-interrupted compression of the heart. The ball of the thumb is pressed against the wall of the chest, between the apex and the sternum, 120 times or oftener per minute. The application of a towel dipped in very hot water to the præcordium is also useful. Slapping of the chest with one dipped in ice-water sometimes recalls the interrupted breathing.

Cocaine hydrochlorate is used for local anæsthesia, especially of the cervix, the urethra, and bladder. It should be applied for 5 minutes in the urethra in a 5 per cent. solution; in the vagina or cervix in a 10 per cent. solution.

Medullary cocainization has too great drawbacks to deserve any frequent application, and ought to be limited to very exceptional cases.¹ For opening abscesses the local use of *ethyl-chloride* is excellent.

There are rare individuals who stop breathing as soon as their consciousness becomes dimmed by any anæsthetic.

Before beginning general anæsthesia two hypodermic syringes should be prepared and solutions of strychnine, nitroglycerine, and sterile camphorated oil (1:4), as well as tincture of digitalis, should be within reach and injected under the skin when pulse and respiration demand stimulation (see *Shock*). It is well also to have a faradic apparatus for provoking contraction of the diaphragm in cases of arrested breathing. Against collapse from cocaine, strong, black coffee and the inhalation of amyl nitrite are the best remedies.

Nausea and vomiting are common occurrences during and after the administration of anæsthetics. No food should be taken by the patient the last six hours before an operation. When she vomits she should be lifted by one shoulder and turned well to the side, so as to give free exit to the substances ejected and prevent them from entering the larynx, which may lead to deglutition pneumonia. After the operation the patient should have only hot-water or ice-water by the teaspoon until all vomiting and nausea have ceased. A few table-

¹ Garrigues, "Text-book of Obstetrics," 1902, pp. 204-207.

spoonfuls of black coffee are, however, also grateful to the patient and have a good effect on the stomach. Deep inhalations with or without acetic acid drive the residuary anæsthetic out from the lower parts of the lungs.

4. *Shock*.—The sudden giving out of vital force, called shock, is a frequent and most dangerous complication of operations. There is an *erethistic* and a *torpid* or *apathetic* form. In the former the sympathetic system alone is affected, in the latter also the cerebrospinal. In the erethistic form consciousness is preserved, and the patient complains of thirst and gasps after air; the skin becomes cold and clammy, the pulse rapid and weak, and the woman often has nausea. In the apathetic form skin and pulse show the same conditions, but there is no nausea, thirst, or dyspnœa. The sphincters relax and there often are involuntary evacuations. Sometimes the patient is taken with convulsions or is delirious, but more frequently she is in a stupor. The chief predisposing cause of shock is fear. It is, therefore, very important to cheer the patient up, and whenever possible she should be anæsthetized before being brought to the operating-room.

The exciting causes are loss of blood, too deep anæsthesia, length of the operation, refrigeration, nervous reflex, and idiosyncrasy. Handling of the intestine should be avoided as much as possible, which is greatly facilitated by the elevated-pelvis position. The removal of the uterus is much more apt to cause shock than that of the appendages. If a protracted and bloody operation is anticipated, it is a wise precaution to tie the base of all four extremities, so as to create reservoirs of blood which gradually may be turned into the general circulation.

To combat shock, strychnine (gr. $\frac{1}{8}$ up to gr. $\frac{1}{4}$ in all—from 2 to 6 milligrammes), tincture of digitalis (m. x up to 3ss—from 60 centigrammes to 2 grammes), nitroglycerin (gr. $\frac{1}{16}$ up to gr. $\frac{1}{8}$ —from $\frac{1}{2}$ to 2 milligrammes) should be injected under the skin, camphorated oil (3ss—2 grammes—of a 25 per cent. solution) should be injected into the deltoid or vastus externus muscle. From one to two quarts of normal salt solution at 120° F. may be injected slowly into the basilic vein, not faster than a quart in ten minutes. The same fluid may be injected into the rectum, which later may be repeated for an hour at the time, with an hour's interval, until the pulsation comes down to 120 or less. If the abdomen is open, the hot saline solution may also be poured into it. If the case is less urgent, the fluid may be injected under the skin. The operation should be finished in the most expeditious way.

5. *Common Instruments*.—Some instruments and appliances are

used so often that they should be available in any operation. Such are a uterine sound, bivalve and univalve specula, vaginal depressors and retractors, dressing-forceps, tenacula, bullet-forceps, tissue-forceps, volsellæ, knives, scissors, needles, a needle-holder, artery-forceps, ligatures, and dressing-material. A *volsella* (Fig. 97) is a traction-forceps

FIG. 97.



Volsella for grasping cervix.

with four prongs, used for seizing and drawing bulky masses,—*e.g.*, the cervix, the uterus, a tumor, etc. A *tissue-forceps* is a forceps with fine teeth for holding delicate tissue. The one illustrated in Fig. 98

FIG. 98.



Tissue-forceps with side teeth.

is convenient for seizing and holding a cut-off strip, that in Fig. 99 is excellent for the peritoneum. A *sponge-holder* (Fig. 100) is a forceps with ring-shaped blades for holding small pads. *Knives* are used less

FIG. 99.



Kocher's tissue-forceps.

than in general surgery. A couple of medium-sized scalpels suffice for any operation. *Scissors*, on the other hand, are frequently employed. A straight one curved on the flat, a blunt-pointed (Fig. 72), and a knee-bent with blunt points are the shapes most commonly required. An

artery-forceps (Fig. 75) is a small-sized pressure-forceps used for hæmostasis. Many kinds of *needles* (Fig. 101) are required: large,

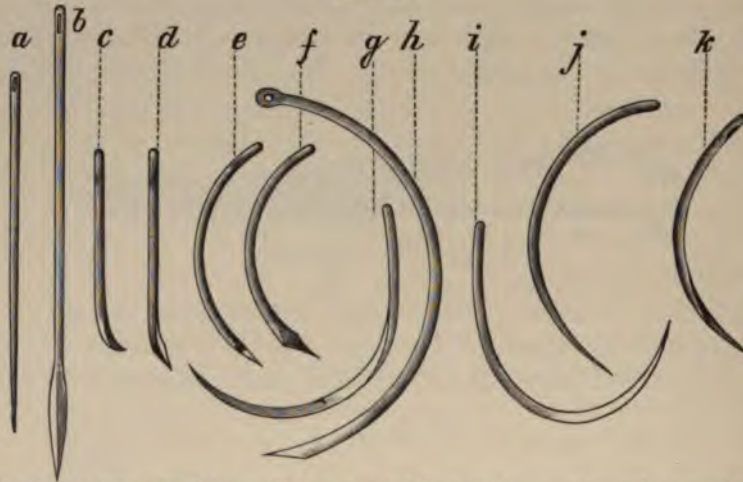
FIG. 100.



Hunter's sponge-holder.

small, straight, curved, round, triangular, and quadrangular, with different kinds of points.¹

FIG. 101.



Needles. *a*, long, straight, round; *b*, spear-pointed, straight; *c*, semi-curved, crescent-ground (Sims's fistula-needle); *d*, semi-curved, trocar-pointed (Emmet's cervix-needle); *e*, curved, crescent-ground; *f*, curved, trocar-pointed (Garrigues's cervix-needle); *g*, strongly-curved, triangular; *h*, semi-circular, quadrangular Hagedorn needle; *i*, fish-hook-shaped, triangular; *j*, Garrigues's larger curved, round needle for the peritoneum and mucous membranes; *k*, Garrigues's smaller curved, round needle for Alexander's operation.

A good needle should have a sharp point, an eye of sufficient size for catgut, and a flat, straight part, a quarter of an inch long, near

¹ I have had three special needles made to order. They are made by Sharp in London and sold by John Campbell, 228 Lexington Avenue, New York. One is a small, curved, round one for fastening the round ligament (*k*); another is larger, curved, round for peritoneum and mucous membrane (*j*); the third is curved, trocar-pointed for the cervix (*f*).

the eye, to give a good hold and prevent turning and breaking in the grasp of the needle-holder; and it should not offer unnecessary resistance in penetrating the tissue. Hagedorn needles differ from all others

FIG. 102.



Matthieu's needle-holder.

by having a small cutting edge at the point, and a large round eye, and being flattened from side to side, so that the broken surface has the shape of a parallelogram. They are the best needles for the skin.

FIG. 103.



Hagedorn's needle-holder.

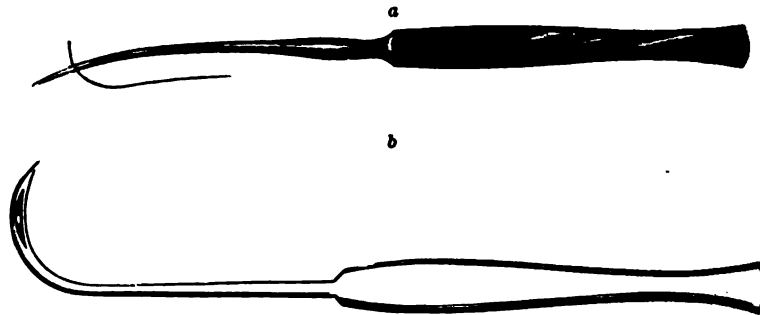
Round needles have the advantage not to tear holes, but they are fit only for soft tissues.

Needle-holders and Handled Needles.—Only large needles can be held directly between the fingers, and even then they are passed less accurately, and the danger of infection is greater than when they are seized with a needle-holder. Matthieu's (Fig. 102) will hold any needle; Hagedorn's (Fig. 103) is meant only for his needles, which it seizes from the concave side a little below the eyes.

Handled needles (Fig. 104) combine needle and holder in one piece, make a rather large hole, but are expeditious and secure accurate adaptation. They are often used for operations on the perineum or for closing the abdominal wound after laparotomy. They have the eye near the point and are most often threaded after having penetrated the tissue.

Instead of a handled needle, many use a *ligature-carrier* (Fig. 105), that is a forceps with slender jaws, curved laterally, between which the ligature is seized.

FIG. 104.



Handled needles. *a*, Tait's slightly-curved, sharp-pointed perineum-needle; *b*, Marcy's needle, strongly-curved, sharp-pointed, with eye from side to side. To this class belongs also Schroeder's half-sharp needle with lateral curvature. (Fig. 73, p. 71.)

Ligatures.—Since reliable catgut has been produced it is preferred to silk in most instances, on account of being absorbable, while silk often gives rise to the formation of a fistulous tract. If it is desirable to prolong the time catgut resists absorption,—*e.g.*, in fastening of the round ligaments or hernia,—it is impregnated with chromic acid—

FIG. 105.



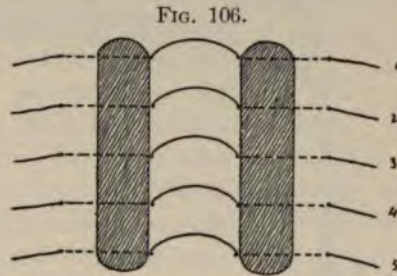
Cleveland's ligature-carrier.

so-called *chromicized catgut*. In exceptional cases the *elastic ligature*, consisting of a rubber thread, is used.

Sutures.—The chief materials employed for stitching wounds are catgut, silk, silkworm gut, kangaroo tendon, and silver wire. Silk is generally tied with a *surgical knot*, for which the other substances are not pliable enough. If a surgical knot is not used, sufficient friction may be produced to prevent slipping by having an assistant press on the first hitch or seize it with an artery-forceps. Silk sutures may be left in the abdominal wall for a week without causing suppuration, silkworm gut and silver wire even longer. Catgut is less suitable for

cutaneous sutures. In the vagina silk may remain for a month. Near drainage-tubes or gauze drains silk is liable to become secondarily infected. It is, therefore, better to use silver wire in such places or remove the drain soon and tie the sutures left open. Sutures should be closed with the *square knot*, or *reef knot*. Catgut tying less securely than silk, should be strengthened by an additional hitch, so that there are three half hitches. When silk or silkworm gut is to be removed, the ends are lifted with a thumb-forceps and one blade of a sharp-pointed pair of scissors is inserted under the suture, close to the stitch-canal, where the thread is cut and pulled across above the line of union.

Thus one avoids carrying dried wound secretion into the stitch-canal and to tear the freshly-united wound-lips apart. Silver wire may be fastened directly in the eye of the needle; but for most plastic



Uniting pared surfaces.

FIG. 107.



Emmet's counter-pressure hook.

operations it is hooked on to a loop of silk, linen, or hemp, which serves as a *wire-carrier*. For this purpose both ends of a thread two feet long are passed through the eye of a needle in the same direction and tied in a half-knot just behind the needle. The wire is bent at a

FIG. 108.



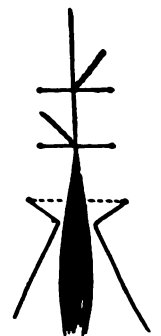
Emmet's wire-twister.

right angle, hooked into the loop, given a twist, and pulled through with a jerk after the thread.

Paring and Uniting Pared Surfaces.—For denuding a surface a tenaculum is inserted into it, and with a pair of curved scissors a strip about a quarter of an inch wide and of even thickness is cut off. If

necessary, similar pieces are removed on the sides of the first. The cutting is done from below upward, to avoid having blood trickling over the part to be incised. Great care should be taken not to leave any islands unpared. The field may be kept clean by sponging or irrigation. When one raw surface is to be united with another (Fig. 106), the needle is, as a rule, inserted a quarter of an inch from the

FIG. 109.



Shouldering silver wire.

outer border, passed under the denuded surface, and out exactly at the inner edge. Next, it is introduced at the corresponding point of the other surface, passed under it, and out a quarter of an inch from the outer edge. In fine plastic work there should be passed five sutures for each inch. When all are in place, they are drawn together and tied from above down. Often it is well to make pressure around the point where the needle is to come out with a counter-pressure hook (Fig. 107), an instrument much like a button-hook.

If silver wire is employed, one end is made to form a slip-knot around the other, and the wire temporarily turned down. When all are in place, the uppermost is separated from the others, the slip-knot is pushed down, and the free end pulled out until the loop is reduced to about an inch. The long end is cut off and the short one and the slip-knot are seized with the *wire-twister* (Fig. 108) and *shouldered*,—i.e., bent with a tenaculum at the point corresponding to the line of union (Fig. 109). The *suture-shield* (Fig. 110) is placed around both strands and pressed gently against the tissue. By means of the twister the wires are twisted together until the sharp edge of the shield is

FIG. 110.



Sims's suture-shield.

reached. Next, the twisted part is bent to one side at the line of union, and again half an inch farther out, where it is cut with strong scissors (Fig. 111) and pressed flat against the adjacent skin or mucous membrane. Silver sutures are usually left in place for nine days, but may remain much longer. When they shall be removed the twisted portion is lifted with the twister and the wire cut and withdrawn as described above.

The kinds of suture most used in gynecic operations are the

interrupted and the *running*, or *continuous*. Rarely the *mattress suture* or *quilled suture* are required. The *tier suture* is a running catgut suture that has two or more layers (Figs. 112, 113). A catgut

FIG. 111.



Bozeman's curved scissors.

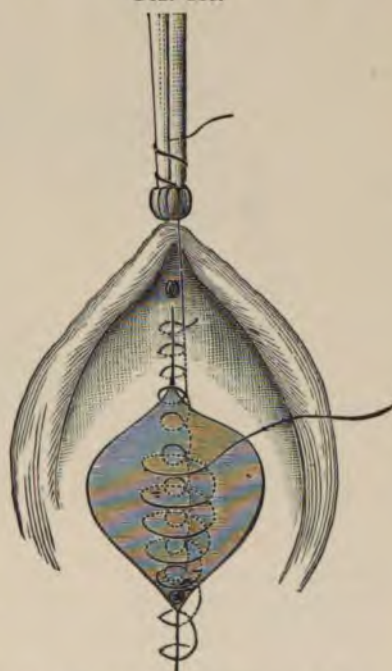
thread a yard long is carried with a needle in a spiral line under the denuded surface and both edges of the wound until the tension becomes too great, when the edges are left untouched and only the

FIG. 112.



Beginning of tier-suture (A. Martin).

FIG. 113.

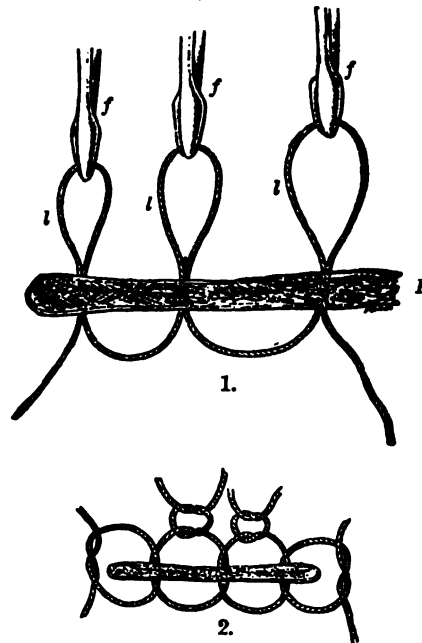


Second deep row of a tier-suture (A. Martin).

deeper portion of the wound is sutured. When there is no more tension, the lower part of the edges are again comprised in the suture. A second and, if needed, more rows are inserted in the remaining surface until the edges are united from end to end.

For hæmostasis or for disposing of redundant tissue, the *looped*, or *glover's*, suture may be employed by passing the needle under the thread of each stitch of the running suture before drawing it taut. *Chain ligature* (Fig. 114) is a kind of suture used to secure thick pedicles of tumors. A long thread is carried with a handled needle through the pedicle and grasped with an artery-forceps. Next, the needle is withdrawn and passed in another place until the whole mass has been disposed of. Then the loops are cut and each two crossed and tied so as to

FIG. 114.



Wallich's chain ligature. 1. *P*, pedicle; *f, f, f*, forceps; *l, l, l*, loops of ligature. 2. Ligatures cut, crossed, and tied loosely.

form links in a chain as shown in the figure. The *cobbler's stitch* (Fig. 115) is also made with a handled needle. A long catgut thread is carried through the part of the pedicle farthest away from the operator (1). The end, *A*, is held by an assistant. The other end, *B*, is liberated from the stitch-canal and the eye (2); and *A* inserted instead (3), withdrawn (4), and carried through another point (5), and so forth, until the whole pedicle is embraced in the stitches passing each two through the same hole. Finally, the two ends are tied together (6).

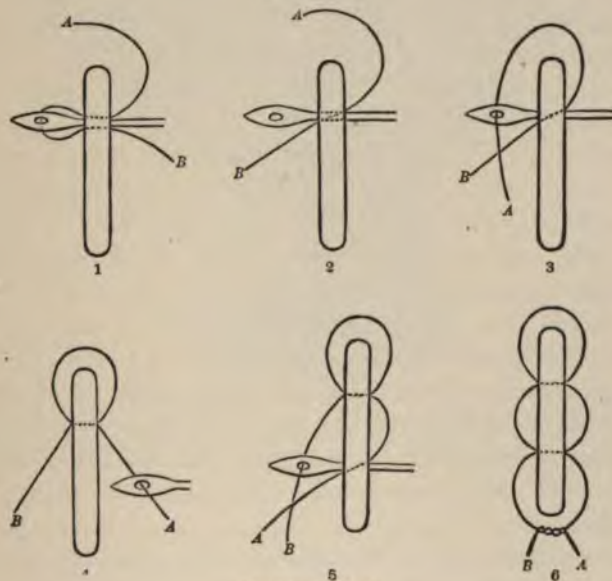
Selection of Instruments.—In making preparations for an operation

the surgeon or his assistants should in their minds go over every step and place the instruments in the order in which they will be needed. But, besides that, they should, within reasonable limits, have in readiness such others that are likely to be required for meeting complications. For safety's sake they should also have several knives, scissors, forceps, needles, etc., in reserve, and an ample supply of ligature and suture material.

Cleaning of Instruments.—Sapolio destroys nickel-plating. Instruments used in an operation should be washed with soap and lukewarm water and wiped perfectly dry.

After-treatment.—If there is no shock, the patient is allowed to sleep until she awakes by herself from the anæsthesia. Otherwise it is

FIG. 115.



Cobbler's stitch.

better to arouse her, sprinkle cold water on her face, shake her, make her talk, etc. Vomiting, nausea, and thirst are treated as described above. No food is given until the nausea has ceased, and then at first only fluids. No solid food should be allowed until the bowels have been moved, and after laparotomy and vaginal hysterectomy not during the first week, although the bowels are moved on the third day. After perineal operations it is done on the fourth day.

CHAPTER V

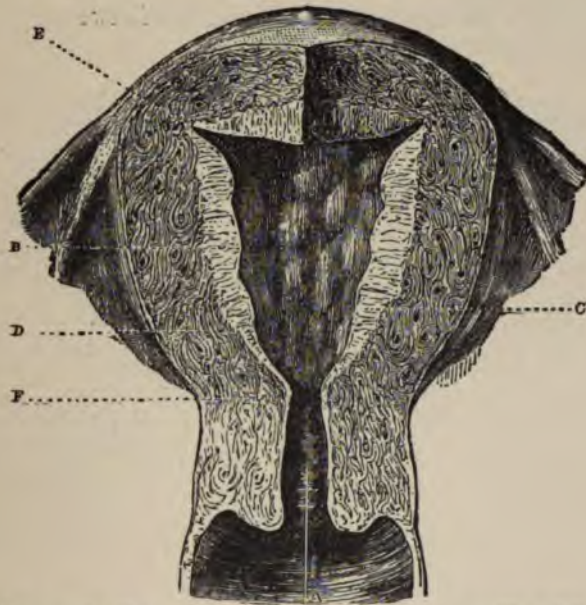
BLOODY DISCHARGE FROM THE GENITALS

§ 1. **Menstruation.**—Menstruation is a flow of blood from the uterine cavity and the Fallopian tubes returning at regular intervals of a lunar month. It is also called *menses*, *catamenia*, the *menstrual period*, *monthly sickness*, *courses*, or *turns*. It is found only in woman and some monkeys. In the temperate zone it begins in most women between the fifteenth and seventeenth years; earlier both under the equator and in the arctic zone. It commences earlier in America than in Europe,—the average being in the former 14, in the latter 15.5 years. Climate has little or no influence on it; but mentality, education, and nerve-stimulation stand out prominently in the United States as factors which determine precocity. In most women menstruation continues till they are between 45 and 50 years old. The amount secreted at each period is on an average about 5 ounces, but great individual diversity obtains in this respect. It is increased by exercise, manual work, chalybeates, and alcoholic beverages. The blood has a peculiar “heavy” odor and contains much mucus. It is secreted by the mucous membrane of the body of the uterus and the tubes, not the cervix. Before the flow, women usually feel a certain heaviness, especially in the lumbar region; but pain always denotes an abnormal condition. In many women the breath has an unpleasant odor during the catamenia. Sexual connection should be absolutely avoided, as it may result in hæmatocele in the woman and urethritis and epididymitis in the man. As a rule, menstruation is suspended during pregnancy and lactation.

The anatomical basis of the menses is a periodical development of the endometrium and the mucous membrane of the tubes. This *menstrual decidua* (Fig. 116) begins to develop a week before the flow. The arteries become much enlarged and form spirals, and the capillaries constitute under the epithelium a mesh-work visible with the naked eye, while the veins remain small. The utricular glands increase much in size and take a zigzag-shaped course. The interglandular connective tissue is filled with an enormous number of round and oval cells, like lymph-corpuscles, and with giant cells with many nuclei. The corpuscular elements originate in granules in the threads of

connective tissue constituting the endometrium (Fig. 117). The blood-pressure is increased, some of the capillaries rupture, and the blood forms extravasations under the epithelium, escapes between its cells, or tears it in some places (Fig. 118); but the whole is not shed, as was formerly believed. Five or six days after the beginning of the flow

FIG. 116.



Uterus during menstruation. (Courty.) Cut open to show the swelling of the whole organ, particularly the mucous membrane. *A*, mucous membrane of the cervix; *B*, *C*, mucous membrane of the corpus, much thickened; *D*, muscular layer; *E*, uterine opening of the Fallopian tube; *F*, internal os.

the mucous membrane commences to return to its normal condition, and eight or nine days after the onset of the flow the regeneration is completed, so that the whole process of development, bleeding, and involution takes about fifteen days. Consequently the female organism is occupied with the menstrual period half the time of from thirty to thirty-five years.

Ovulation.—In mammalia the relation between rut and ovulation is perfectly known. Before each recurrence of the condition called *rut* or *heat*, one or more Graafian follicles rupture. If the animal is covered during this time, as a rule impregnation takes place, and in the ovaries develop as many corpora lutea as there are fetuses. It is not

known whether there is a similar connection between menstruation and ovulation, whether ovulation is periodical or not, and if so, whether the period is simultaneous with that of menstruation. Still, it appears that there is a constant relation between the time elapsed since the last menstruation and the stage of development of the corpus luteum. In woman a single coition at any time may lead to pregnancy; but the likelihood of this occurrence is much greater near—especially before—menstruation than midway between two periods.

FIG. 117.



Fibre of endometrium, showing different degrees of development from granules to cells.
Enlarged three thousand times. (A. Johnstone.)

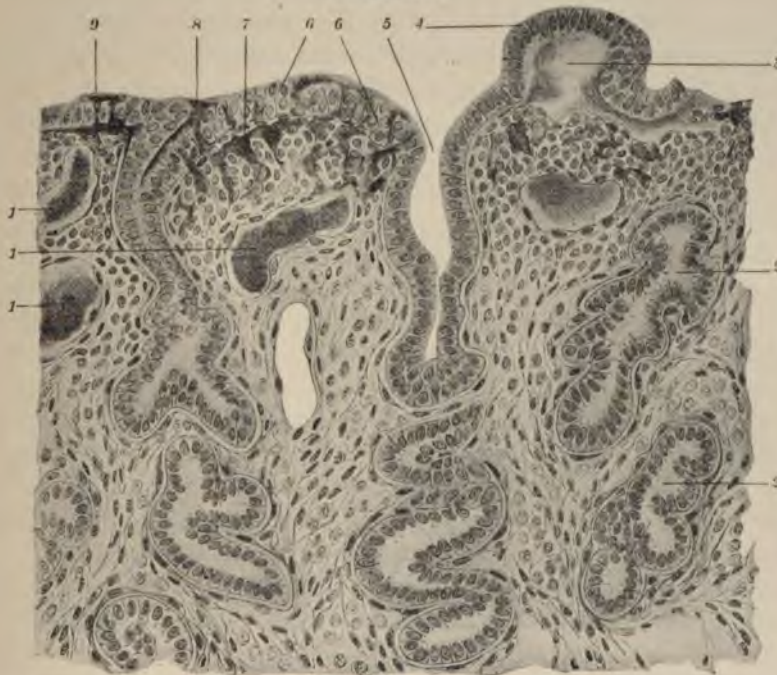
The fact that fecundation takes place does, however, not prove that at the moment of connection an ovum was expelled from the ovary, for both ova and spermatozooids may be preserved for some time in the genital tract. When impregnation follows a single coitus in the middle of the intermenstrual period, it is, therefore, possible that the spermatozooids are preserved and meet an ovum detached at the following menstruation.

Influence of Operations on Menstruation.—It is quite common to

see a bloody discharge from the uterus appear a few days after the removal of the ovaries, or to observe a similar bleeding from another organ, such as the rectum, the bladder, or the nose. This is probably due to irritation of the nerves comprised in the pedicle. On the other hand, menstruation ceases permanently in most cases of double ovariectomy or oöphorectomy, but exceptions from this rule are common.

Theory of Menstruation.—The cause of menstruation is unknown. It is said to be a necessity in woman and erect animals, because their

FIG. 118.



Perpendicular section through the superficial layer of the endometrium on the second day of menstruation. 1. Enlarged capillaries; 2, gland; 3, subepithelial extravasation of blood; 4, epithellum, lifted by blood; 5, entrance of much-convoluted gland; 6, epithellum impregnated with blood; 7, blood in the subepithelial connective tissue; 8, duct of gland; 9, blood passing between the epithelial cells. (Bumm.)

compact uteri have not lymphatics enough to carry off the multitude of cells formed in the endometrium, while animals whose trunk is horizontal have large, flabby uteri, with an enormously developed lymphatic system. If there is a relation between ovulation and men-

struation, both are probably regulated by a common centre in the central organs of the nervous system.

Precocious menstruation is the regularly recurring discharge of blood from the uterus in children. This is a rare disease, often combined with a corresponding early development of the internal and external genitals, the breasts, and sexual appetite. It has been observed as early as the first or second year and weakens the child. All that can be done for the little one is to keep it quiet during the flow, watch it in regard to masturbation, and try clitoridectomy, which may help to quiet the nervous system. To endeavor to check the hemorrhage might lead to a more dangerous vicarious menstruation.

Menstruation is called *tardy* when it occurs for the first time long after the age of puberty, *scanty* when the amount lost is unusually small. In regard to treatment, see *Amenorrhœa*.

§ 2. *Amenorrhœa*.—*Amenorrhœa*, in the wider sense, means absence of menstruation. There are two varieties, *suppression of menses* and a complete *absence of menstruation*, or *amenorrhœa* in the narrower sense.

1. *Suppression of menses* is a sudden arrest of the menstrual flow. It is generally due to exposure to wet and cold during the period, to emotions, or to intercurrent inflammation in other organs, such as pneumonia or erysipelas. In some cases the interruption has no apparent consequences, but in others it causes congestion, entrance of blood into the peritoneal cavity, extravasation into the connective tissue of the pelvis, or acute inflammation of the womb and its appendages. Sometimes the flow reappears when it is due the next time; but in other patients it does not return for several months, and perhaps never.

Treatment.—It is proper to try to re-establish the interrupted discharge by means of hot applications to the abdomen, hot sitz baths, hot enemas and vaginal douches; but, as a rule, the flow does not reappear before the next period. Pain should be relieved by opiates.

2. *Amenorrhœa proper* is the condition in which the catamenia do not appear at puberty or fail to return. We have seen above that in some women menstruation begins unusually late,—so-called *tardy menstruation*,—and that in general it is discontinued during pregnancy and lactation. Some women never menstruate, and are still enjoying good health. Others have their courses only when they are pregnant; but these are rare exceptions. As a rule, the nonappearance or failure to return of menses has an assignable cause and produces dis-

turbances in the system. Often amenorrhœa is due to a change of mode of living, especially change of climate or removal from country to city. Sometimes it occurs in newly-married women, although they are not pregnant. Frequently it accompanies debilitating diseases, such as anæmia, malaria, phthisis, diabetes, etc. It is not rare in insane women and morphomaniacs. It is common in those who are affected with obesity and in young, over-worked girls. Sometimes it begins as a suppression of the menses. The nonappearance may also be due to imperfect development of the internal genitals or an obstruction in the genital canal. The removal of the ovaries is usually followed by permanent discontinuation of the menses.

Functional amenorrhœa is commonly accompanied by headache, congestion to the head, and general malaise; and sometimes by nausea, vomiting, nervousness, or even convulsions. If there is an obstruction that prevents the blood from escaping, it accumulates and forms a tumor in the abdomen. Every four weeks the patient has an attack of severe abdominal pain, so-called *menstrual colic*.

Diagnosis.—The possibility of pregnancy must always be borne in mind, and all signs of early gestation should be looked for. If it is ectopic, there may, besides other signs, be felt a tumor close to the uterus.

Treatment.—The physician should beware of looking upon amenorrhœa as a disease in itself, calling for re-establishment of the flow. Often the woman does not menstruate because she has no blood to lose, and to bring on the flow would only aggravate her condition. If the nonappearance of the catamenia is due to anæmia or wasting diseases, an invigorating treatment, especially iron, arsenic, quinine, red bone-marrow, strychnine, and phosphorus, is indicated. In malaria quinine and arsenic are the chief remedies. Aperients, particularly aloes, help to bring on the flow. The nervous symptoms must be combated with anodynes and sedatives—opium, phenacetin, or bromides. Warm general baths or hot sitz baths and foot baths, with or without mustard, help sometimes. The introduction of the uterine sound stimulates the uterus; but it becomes much more effective if combined with electricity, either faradization, especially with a bipolar electrode, or galvanism, with the negative pole in the uterus. The latter is the most effective of all remedies. There are also many drugs which have the effect of bringing on the catamenia—so-called *emmenagogues*: permanganate of potassium (gr. ii to iv—10 to 25 centigrammes t. i. d.), santalin (gr. ii or iii—10 to 20 centigrammes t. i. d.),

oleum sabinæ (℥ iii to vi—20 to 40 centigrammes t. i. d.), oleum tanacetii (℥ iii to vi—20 to 40 centigrammes t. i. d.), oleum hedeomæ (℥ ii to x—10 to 60 centigrammes t. i. d.), ergot, and decoctum gossypii. If there is a mechanical obstruction, it should be removed. If the uterus is rudimentary and the patient suffers from molimen, particularly convulsions, the ovaries should be extirpated.

§ 3. **Vicarious Menstruation.**—Vicarious menstruation, or *xenomenia*, consists in the expulsion of blood from another organ than the uterus at the time of menstruation, either instead of the normal flow or conjointly with it. Such bleeding may occur from any mucous membrane, most frequently the stomach, the lungs, or the breasts; or from the skin. Sometimes another secretion, such as leucorrhœa, profuse diarrhœa, perspiration, or the production of colostrum¹ replaces the menstrual flow. It is a rather rare affection, which most frequently has been observed in weakly, nervous, hysterical women. The blood oozes commonly from wounds or ulcers, or escapes from varicose veins. Generally the patient has both pelvic molimen and swelling and pain where the abnormal discharge takes place. The importance of the case depends largely on the locality from which the blood comes. Thus hæmoptysis and hæmatemesis are much more serious than epistaxis or distillation of blood from the cutaneous surface. If one succeeds in re-establishing or increasing the normal secretion, the prospects for the cessation of the abnormal discharge are rather good. The treatment is, therefore, chiefly directed against the amenorrhœa or scanty menstruation. The abnormal bleeding or other discharge is treated as similar occurrences under other circumstances.

§ 4. **Dysmenorrhœa.**—We have seen above that menstruation is normally preceded or accompanied by a sensation of heaviness; when it gives rise to real pain the condition is called dysmenorrhœa. The pain may vary in intensity from a discomfort to torture unfitting the patient for any work and obliging her to remain in bed. The starting-point may be in the uterus, the ovaries, or any other part of the pelvis. If it is of ovarian origin, it comes earlier, often as much as eight or ten days before the flow, while that derived from the uterus precedes the appearance of the menses only by a day or two or accompanies it, especially in the beginning. The uterine pain is felt in the hypogastric region, the ovarian more in the side of the pelvis and the iliac fossa.

Uterine dysmenorrhœa is most frequently due to inflammation of

¹Garriques, Amer. Jour. Obst., 1884, vol. xvii., p. 524.

the lining mucous membrane. The cervical canal may be too narrow or there may be a flexion, particularly forward, or a polypus closing the internal os. Sometimes the stagnating blood coagulates in the uterus and clots are expelled with labor-like pain. In other cases the superficial layer of the endometrium is thrown off in one piece or in shreds—so-called *membranous dysmenorrhœa*. The dysmenorrhœa caused by closure of the genital canal has been described above.

Ovarian dysmenorrhœa is due to inflammation of the ovary, too great toughness of its tissue, or adhesions enveloping it.

Nervous dysmenorrhœa is produced by an abnormal sensitiveness or spastic contraction of the internal os.

The *prognosis* depends on the cause. In most cases we may promise relief, if not a cure.

The *treatment* varies also with the cause. In unmarried women without any inflammatory complications an examination may temporarily be dispensed with. Tonics, exercise in open air, gymnastics, cold baths, and sea-bathing will often effect a cure. If there is any inflammation, exercise is not well borne, and the patient should remain in bed as long as the pain lasts. The treatment adapted to the different special conditions will be set forth in following chapters, but for convenience we will give a résumé of it here. In all chronic inflammations hot vaginal injections, painting of the vaginal vault or the lower part of the abdomen with tincture of iodine, pledgets with glycerin, iodine glycerin, or ichthyol glycerin are indicated. In endometritis applications are made to the inflamed membrane. High tension faradization and the galvanic current are very effective. In ante flexion the regular introduction of the uterine sound before the expected period affords great relief. By splitting the posterior lip and wall of the cervix a freer exit is made for the blood. A retroflexed uterus should be replaced and kept *in situ* with a pessary or by an operation. A narrow cervical canal is dilated. Nervous dysmenorrhœa calls for sedatives and tonics. The use of narcotics should be restricted as much as possible, in order not to create a drug-habit. In some cases they are, however, indispensable. In the milder cases hot, dry or wet applications to the abdomen are grateful. Hot drinks, such as a cup of tea, a glass of toddy, or infusion of chamomile flowers (*matricaria*) and peppermint leaves, also relieve the pain. *Viburnum prunifolium* is a valuable uterine sedative. Since the taste of the fluid extract is very unpleasant, it may be inspissated and given in capsules. Antipyrin, antifebrin, or phenacetin often has a marked effect. Tincture

of *cannabis indica* (20 drops every three hours) and *apiol* (m v—30 centigrammes—in a capsule, three to six times a day) are used. Dried thyroid of sheep (gr. i to ii—5 to 10 centigrammes t. i. d.), two days before and during menstruation, has been praised of late.

§ 5. **Menorrhagia and Metrorrhagia.**—1. *Menorrhagia* means too great a loss of blood at the time of menstruation. The flow may return too soon, last too long, or be too profuse. Since the normal amount of blood excreted is not known and varies greatly in healthy individuals, it is difficult to say where menorrhagia begins; but practically we use the term when a woman suddenly loses much more blood at her menstrual periods than before, or when the loss causes a sensation of weakness.

Menorrhagia may be of uterine or ovarian origin or be due to general diseases. Thus it may be caused by endometritis, chronic metritis, granular os, displacements, myoma, cancer, oophoritis, or a small ovarian tumor; cholera, smallpox, scarlet fever, typhoid fever, inflammatory rheumatism; syphilis or malaria. Sometimes the obstruction opposed to free circulation by diseases of the heart, the liver, or the kidneys produces too profuse catamenia. It may occur in very young girls shortly after puberty or in somewhat older girls, when it arises from anæmia, preventing coagulation in the capillaries, or from neurasthenia, weakening the normal inhibition from the vasomotor nerves or the stimulus which makes the uterine muscular tissue contract.

If the loss of blood is very great, it may cause acute anæmia, with cold, clammy skin, pallor, dyspnœa, faintness, pulselessness, convulsions, and death. But much more frequently the effect is a chronic anæmia, characterized by pallor, weakness, neuralgia, asthenopia, and backache.

The distinction between menorrhagia and metrorrhagia—hemorrhage independent of menstruation—is sometimes difficult, because the type of the latter may become so irregular that the patient does not know when to expect her period; but, as a rule, the menstrual flow has premonitory symptoms and comes on more gradually, and the blood is mixed with mucus.

Too frequent and too profuse bleeding undermines the constitution and shortens life.

Treatment.—In the milder degrees it suffices to order rest; hæmostatic drugs; cool, bland diet; and abstinence from alcoholic drinks and coffee. The bowels should be kept open with a saline aperient. If

there is any nervous excitement or pain, bromides by the mouth and opium suppositories are beneficial. In severer hemorrhage, an ice-bag is placed over the symphysis pubis or a hot-water bag on the lumbar region or vaginal or intra-uterine injections with plain hot water or dilute liquor ferri chloridi are used. Finally, the vagina is tamponed, and if deemed necessary this may be combined with an intra-uterine tampon of gauze impregnated with suprarenal capsule powder in 5 per cent. solution or liquor ferri chloridi diluted with 10 parts of water.

To this treatment of the attack ought in the intermenstrual period to be added some treatment of the underlying condition causing the hemorrhage. If the endometrium is diseased, applications should be made with liquor ferri chloridi, ferripyrin, or formalin. It should be curetted or subjected to galvanochemical cauterization with the positive pole in the uterus. Granulations around the os should be destroyed, a polypus removed, a torn cervix sewn up, a fibroid treated as will be explained later. Inflamed ovaries are treated with internal resolvents, tincture of iodine, medicated pledgets, galvanism, or operative interference. In cases of deficient nerve-force, tonic medicines should be prescribed, as well as hydrotherapy or sea baths, mountain air, out-door sports, local and general massage, and gymnastics. In heart disease a moderate bleeding is often beneficial, and should, therefore, not be checked too soon. Digitalis, strophanthus, and aconite are the chief remedies. If the action of the liver is torpid, the diet must be regulated and alcohol forbidden. Pulvis hydrargyri cum creta or euonymin is indicated. In kidney disease great attention should be paid to the free action of the bowels and a good condition of the skin. Between the hemorrhages everything should be done to build up the system with nutritious food and tonic medicines.

It must be remembered that a certain loss of blood at the monthly period is normal and should be allowed before measures are taken to check it. Generally we may let the patient bleed for from two to four days before attempting to check or arrest the flow; but a sudden alarming hemorrhage calls for immediate and most active interference. In cases that resist all other treatment, oöphorectomy offers a last resort.

2. *Metrorrhagia* differs from *menorrhagia* by occurring at other times than the catamenia. It is essentially abnormal, and should, therefore, not be allowed to continue, except when a certain loss of blood is deemed beneficial for an existing disease,—*e.g.*, pelvic inflammation.

§ 6. **General Menstrual Disorders.**—Menstruation being a general condition which affects the whole body, there are frequently manifestations of such influence in nearly every organ, besides the excretion of blood from the endometrium. These general disturbances are especially marked in cases of amenorrhœa or scanty menstruation. One ovary often swells. Likewise myomas and the breasts. The latter become painful and show sometimes vicarious menstruation. Leucorrhœa commonly precedes or follows the menses. Many nervous disorders, reaching convulsions or insanity, are frequent. Blood may be extravasated in the anterior camera of the eye or behind the retina. Optic neuritis, retinitis, and complete amaurosis have occurred. Sties are quite frequent. Blood may trickle from the ears. Profuse epistaxis may replace the catamenial discharge. The skin often becomes the seat of eruptions or vicarious menstruation. Hæmatemesis is not rare, or there may be a hemorrhoidal bleeding or diarrhœa. The liver is sometimes congested, which may lead to icterus. The thyroid body frequently swells. Hæmoptysis may have the character of vicarious menstruation and be the beginning of phthisis. There is an abnormal desire to empty the bladder, which may also secrete blood. Persons affected with chronic diseases usually feel worse during menstruation.

Treatment.—Generally, every means of bringing back or increasing the normal flow should be tried, except in cases of so great weakness that there is ground for the fear that any loss of blood may aggravate the existing condition. The special disorders are treated according to the general principles for their cure independently of the catamenia.

CHAPTER VI

MUCOUS DISCHARGE FROM THE GENITALS, OR LEUCORRHŒA

NORMALLY the mucous membrane of the genital canal is just moist enough to be slippery. Any accumulation or discharge of fluid is abnormal and constitutes, or is a symptom of, a disease. The word leucorrhœa means a white flow ; but it comprises any discharge except a purely bloody one, be it white, yellow, or brown, from the genitals. When of a white color, it is popularly called *the whites*. The discharge may originate from the vulva, the vagina, or the tubes. It may be serous, mucous, purulent, or mixed with blood. That secreted by the vulva and vagina has acid reaction, while that which comes from the uterus or tube is alkaline. A thick, glairy one, like the raw white of an egg, can be produced only by the goblet-shaped cells of the cervix. The other kinds may be distinguished by their microscopical contents. That from the vulva and the vagina is characterized by the presence of large, flat epithelial cells; that from the cervix is rich in lymphoid bodies; that from any part of the uterus may contain cylindrical epithelial cells, which may be ciliated. A watery discharge comes from the uterus or the tubes, a purulent discharge may come from any place. The white color is due to admixture of cells, the yellow denotes pus, the brown is indicative of old blood being mixed with mucus.

Leucorrhœa may be *idiopathic*, *specific*, or *symptomatic*. It is called *idiopathic* when it constitutes the whole disease, without any structural change. The *specific* is produced by infection with gonococci. The *symptomatic* is a symptom of some disease.

1. The *idiopathic* may, like other catarrhs, and often in conjunction with them, be due to a damp, cold climate or residence. It may be caused by protracted lactation, bodily fatigue, mental overwork, emotions, or insufficient nourishment. It is common in persons predisposed to phthisis. It may arise from local irritation, such as masturbation, too frequent coition, pessaries, gravidity, childbirth, or abortion. It may also have a vicarious or supplementary character in cases of amenorrhœa, scanty menstruation, or the menopause; or it may take the place of perspiration, diarrhœa, or other discharges.

2. The *specific* leucorrhœa will be described under **VENEREAL DISEASES**.

3. The *symptomatic* may be a symptom of rheumatism, scrofulosis, tuberculosis, malaria, anæmia, or plethora; or of numerous local diseases of the genitals and diseases in other organs, interfering with free circulation of the blood, such as diseases of the heart, lungs, liver, or kidneys.

Leucorrhœa weakens the organism, causes anæmia, neuralgia, back-ache, dyspepsia, and menstrual disorders, either too much or too little blood being expelled. It is often hard to cure.

Treatment.—Generally, local and general treatment should be combined. Only in young virgins an examination should be avoided, if possible. The patient should have plenty of substantial food, except when the cause is plethora. Her bowels should be kept open. She should be much in the open air. She should have woollen underwear. She should occupy a dry, sunny room. Change of air and pleasant surroundings have a beneficial effect. Sea baths and other cold baths are useful, but in rheumatic patients Turkish or Russian baths are better. Tonic medicines should be prescribed. Aletris cordial (a teaspoonful t. i. d.) and fluid extract of hydrastis (℥ xx—120 centigrammes) arrest sometimes the discharge. In most cases a local treatment is necessary, such as applications, painting with tincture of iodine, the insertion of pledgets or suppositories containing astringents, vaginal injections of hot water or astringent fluids. A narrow cervical canal should be dilated, a diseased mucous membrane curetted or cauterized. The whole mucous membrane of the cervix may be cut away. In phthisical patients only the mildest local treatment should be used; but cod-liver oil, Russel's emulsion, terraline and hydrolein are well adapted both to their pulmonary affection and their leucorrhœa.

SPECIAL DIVISION

CHAPTER I

DISEASES OF THE VULVA

§ 1. **Malformations.**¹—1. *Absence of Vulva.*—The skin may cover uninterruptedly the whole perineal region. There is neither anus nor vulva; but in the depth there is a common cavity, called *cloaca*, communicating with the rectum, the allantois,—which is the beginning of the bladder,—and the two Müllerian ducts,—which are the first rudiments of the vagina, the uterus, and the Fallopian tubes (Fig. 119). This anomaly is found only in non-viable fetuses, and is due to an arrest of development in the first month. If the anus is formed, excrements are expelled that way; the urine may be evacuated through the navel, and the child continue to live without external genitals.

2. *Abnormalities of the Clitoris.*—The clitoris may, in rare cases, be split, which is of no importance. It may be absent, very small, or as large as a medium-sized penis. The latter condition may form an obstruction in copulation, and the surplus of tissue may then be removed with the galvanocautic wire, with an *écraseur*, or with the thermocautery.

The prepuce is frequently adherent to the glans, which may produce nervous reflexes, even epilepsy or nymphomania. The adhesions should then be separated; but as it is painful, the child should be anæsthetized with chloroform or local anæsthesia, produced by injecting two or three drops of a 2 per cent. solution into the glans and four or five more into the prepuce, which then is seized with a forceps, while the thumb-nail separates the adhesions. The raw surface is sprinkled with iodoform and covered with iodoform gauze, which is renewed every two or three days until normal smegma



FIG. 119.
Fetal pelvis, first month. (Schroeder.) Urogenital organs communicating with rectum in subcutaneous cloaca. Absence of anus and vulva. *all*, allantois; *r*, rectum; *m*, Müller's duct.

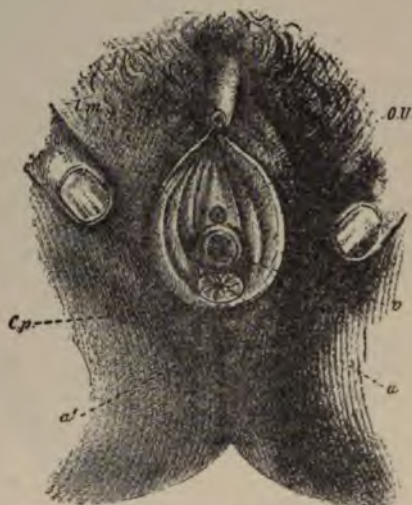
¹ Garrigues, "Malformations of the Female Genitals." Mann's System of Gynecology. Philadelphia, 1887, Lea.

makes its appearance. As there is great tendency to recurrence of the adhesions, the case should be watched carefully.

3. *Abnormalities of Labia Minora*.—The nymphæ may be absent or split in two or three flaps. They may be hypertrophic. In the women of the Bushmen in South Africa and some Hottentot women

they may hang half-way down to the knees, forming the so-called *Hottentot apron*. If the condition interferes with coition, it may be remedied by cutting away the superfluous tissue and uniting the edges of the wounds with suture.

FIG. 120.



Anus vulvaris. (Himmelfarb.)—O.U., urethral orifice; v, vaginal entrance and hymen; C.p., posterior commissure; a, anus; a', perineum.

4. *Abnormalities of the Labia Majora*.—They may be split longitudinally. They may extend back behind the anus. Then there is no perineum, and the rectum opens in the fossa navicularis. This anomaly is known under the incorrect name of *atresia ani vestibularis* (Fig. 120). There is neither atresia of the anus nor does it open into the vesti-

bule. The condition is due to an arrest of development,—the partition that normally should be found between the rectum and the urogenital sinus (Fig. 121) failing to be developed. The opening may have a sphincter or not. If it has, it is better not to interfere with it, as the innervation may be lost by the operation and the condition made worse. Otherwise, an opening may be made behind the vulva and the rectum united with it.

5. *Epithelial Coalescence*.—During the second half of fetal development the labia majora and minora of the two sides may coalesce, partially closing the vulva. This may give the urine an inconvenient direction, prevent coition, or oppose a serious obstacle to childbirth. A director should, therefore, be introduced through the remaining opening and the two sides separated in the median line with the knife. Next each side is closed separately with suture.

6. *Hermaphroditism*.¹—Hermaphroditism, or *hermaphroditism*, is a condition in which the characteristics of the two sexes (Hermes and Aphrodite) are more or less combined in one individual. Embryology teaches us that the genitals are composed of three parts,—the sexual glands, two sets of ducts (the Müllerian ducts and the Wolffian ducts), and the external genitals,—each of which has its separate substratum. Originally these parts are identical in both sexes, and it is not difficult to understand that one of these component parts may develop more according to the type of one sex, and the others in the opposite direction.

At the end of the second month the ovary begins to differ from the testicle. In the male the Müllerian ducts soon disappear, leaving as remnants the hydatid of Morgagni and the vesicula prostatica. In the female, on the other hand, they undergo great development and are transformed to the vagina, the uterus, and the Fallopian tubes. The Wolffian ducts become in the male the tail of the epididymis and the vas deferens, while in the female they disappear, except some remnants found in the broad ligaments.

The external genitals are identical until the tenth week. We have seen above that originally the intestine communicates with the urogenital organs (Fig. 119) in a common cavity called the cloaca. Towards the end of the first month this opens on the skin in the *cloacal opening*. In front of this is formed in the sixth week a protuberance called the *genital tubercle*, at the sides of which soon rise two folds, designated the *genital folds*. The genital tubercle grows, and towards the end of the second month there appears on its lower surface a groove which is termed the *genital furrow* (Fig. 122). In the female the genital tubercle becomes the clitoris, the genital folds form the labia majora, the edges of the genital furrow are developed into the labia minora, an extension of which later surrounds the clitoris and constitutes the prepuce. In the tenth week the separation between the urogenital sinus and the rectum is completed. The genital folds blend at their posterior end, forming a perineum, which coalesces with the partition between the rectum and the urogenital sinus. In the male the genital tubercle becomes the penis, the edges of the gen-

FIG. 121.



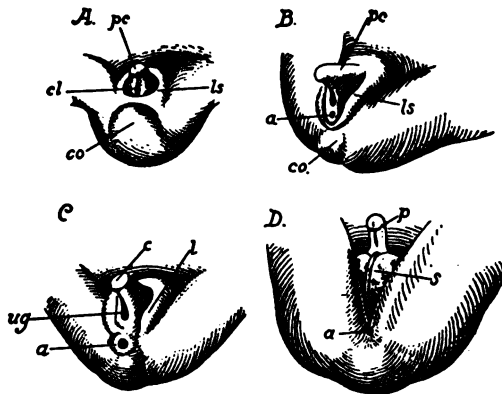
Partition between the rectum and the urogenital sinus. (Schroeder.) r, rectum; v, vagina; s, urogenital sinus; b, bladder; u, urethra; c, clitoris.

¹Garrigues, "A Supposed Hermaphrodite, Sexual Inversion." The Clinical Recorder, April, 1897, vol. ii., No. 2, p. 4.

ital furrow grow together, constituting the urethra, and the genital folds coalesce, making up the scrotum and the perineum. In the open condition, which continues till the eleventh or twelfth week, the external parts resemble much the later female organs.

Hermaphroditism is *true* or *spurious*. It is called *true* when at least one ovary and one testicle are found in the same person. This com-

FIG. 122.



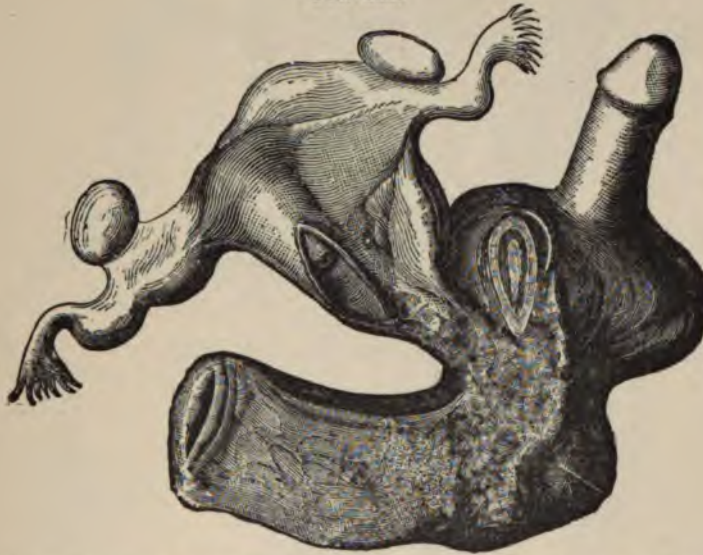
Development of the external genitals. (Ecker.) *A*, the external sexual organs of a fetus of about nine weeks. There is no difference between the sexes, and the cloaca still exists. *B*, the same from a fetus a little more advanced. The anus is separated from the urogenital opening, but the sex is not yet differentiated; *C*, the same from an embryo of about ten weeks, showing the female type; *D*, the same in a male embryo a little more advanced; *pc*, common blastema of penis and clitoris, or genital tubercle; *p*, penis; *c*, clitoris; *cl*, cloacal opening; *ug*, urogenital opening; *a*, anus; *ls*, cutaneous elevation which becomes the labia majora or the scrotum, the genital folds; *l*, labium; *s*, scrotum; *co*, coccygeal, or caudal, elevation.

bination is at best exceedingly rare, and its existence is not generally admitted. It has, however, been asserted that there may be an ovary and a testicle on both sides—*true bilateral hermaphroditism*; that there may be an ovary and a testicle on one side and either an ovary or a testicle on the other—*true unilateral hermaphroditism*; and, finally, that there may be an ovary on one side and a testicle on the other—*true lateral hermaphroditism*. Since we have seen that the sexual glands originally are identical, and that there is only one on each side, it is somewhat surprising that there should be a double set on both sides or on one side. But supernumerary ovaries are by no means rare, and occasionally a third testicle has been found in man. Besides, it is doubtful whether the epithelial part of the sexual glands has the same origin in the two sexes. In woman it is derived from the

germinal epithelium, an agglomeration of cells in the peritoneal cavity; but some anatomists think that the seminal canals are formed by invagination from the Wolffian duct.

Spurious hermaphroditism, or *pseudohermaphroditism*, is that anomaly in which the sexual glands belong to one sex and the tubes leading from them, as well as the external genitals, have the characters of the other. Spurious hermaphroditism is called *male* or *female* according to the nature of the sexual glands. Each of these is subdivided into three classes. The glands and the external genitals may have the same

FIG. 123.



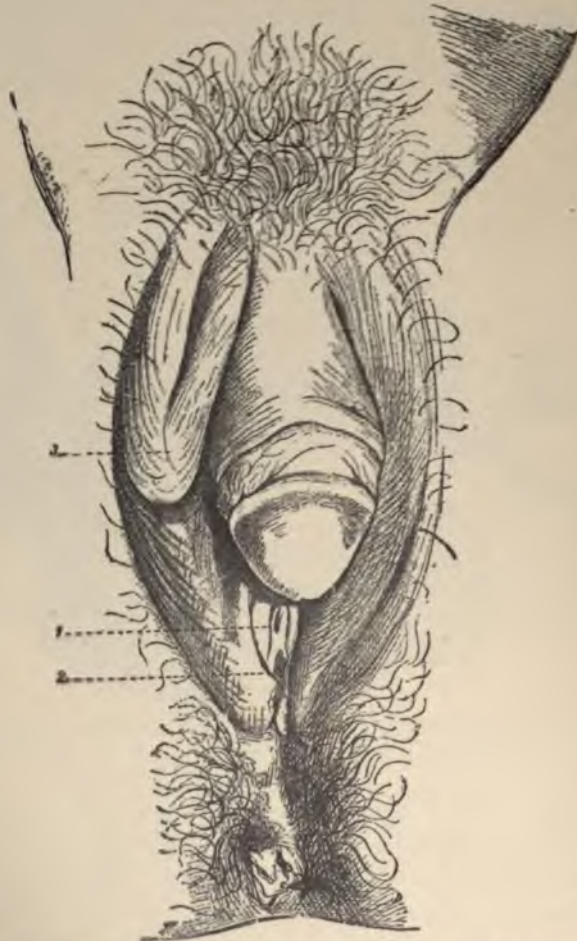
Male internal and external pseudohermaphroditism. Testicles, penis, and scrotum combined with vagina, uterus, and tubes.

type, while the canals connecting them have that of the opposite sex. This is designated *internal male* or *female pseudohermaphroditism*. The external genitals alone may belong to the opposite sex, while glands and ducts have the characteristic of one sex—*external male* or *female pseudohermaphroditism*. Finally, both the ducts and the external genitals may belong to another sex than the glands, which is termed *internal and external*, or *complete*, *male* or *female pseudohermaphroditism* (Figs. 123, 124). Hermaphroditism dates from the earliest period of fetal development, and while the true is exceedingly rare or even doubtful, the spurious is so common that over a thousand cases have

been described. It is much more common in the male than in female sex.

The general appearance of the body, especially the length of hair, the development of the breasts, the width of the hips, the pro

FIG. 124.

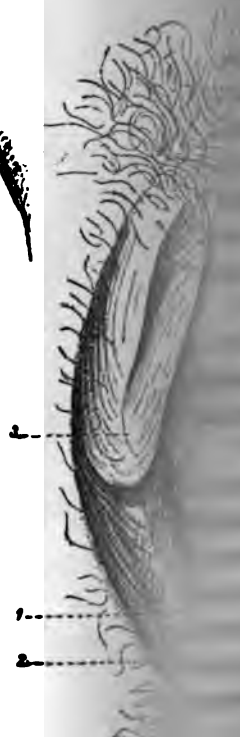


Female external pseudohermaphroditism. (Fehling.) An ovary was removed from the right labium majus. 1, Urethra; 2, rudimentary vagina; 3, labium majus, containing ovary.

presence of the larynx, the rotundity or angularity of the forms, present a mixture of both sexes (Fig. 125). The presence of menstruation does not prove that the individual is a woman, for a similar regul

been described. It is much more
female sex.

The general appearance of the
hair, the development of the br-



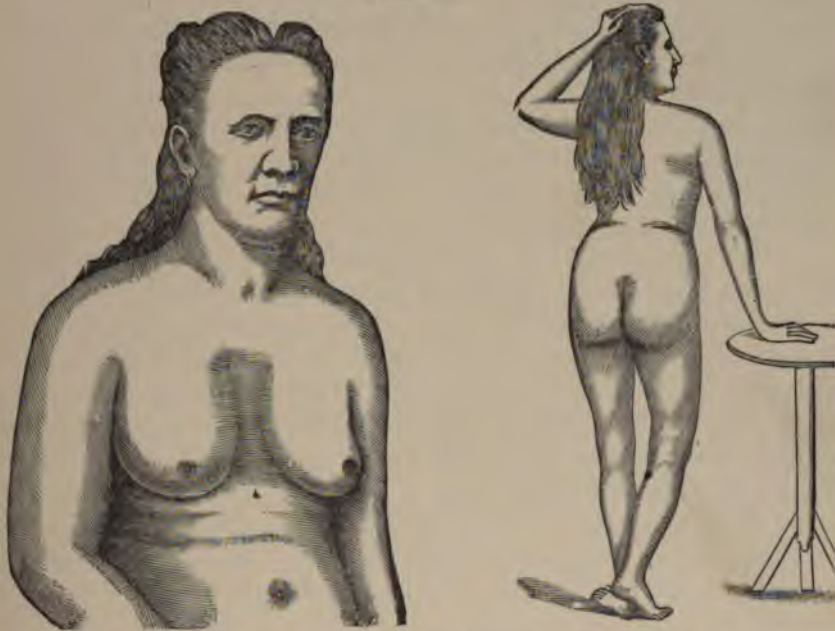
Female external pseudohermaphrodite.
1, Urethra; 2, rudimentary

nence of the larynx, the
a mixture of both sexes
does not prove that the

bloody discharge from the genitals has been found in men. The voice is also deceptive.

The determination of the true sex of a pseudohermaphrodite may be difficult or even impossible in the living,—nay, anatomical specimens have been interpreted differently by authorities on pathology. The discovery of spermatozooids in mucus secreted by the genitals makes it sure that the individual from whom it comes is a man, while the occurrence of pregnancy settles the diagnosis of the person being a woman. If the epididymis can be felt, it distinguishes a doubtful

FIG. 125.



Carl Lohman, supposed male pseudohermaphrodite, who lived as a woman for forty-six years and then married as a man.

male sexual gland from a female one. If there is any doubt as to the true sex, the individual should be declared a male, which gives certain political and civil rights and is much safer from a moral standpoint.

§ 2. Ruptures (Herniæ).—Two varieties of herniæ may enter the labia majora,—viz., the *anterior*, or *inguinolabial*, and the *posterior*, or *vaginolabial*, hernia.

1. The ANTERIOR LABIAL, OR INGUINOLABIAL, HERNIA corresponds to the inguinal hernia in man. The gut descends through the inguinal canal

and enters the anterior portion of the labium majus. It may be found on both sides—*double* inguinal hernia. The tumor forms at first a globular prominence at the external inguinal ring, which later becomes pear-shaped. It may contain the intestine, omentum, an ovary, a tube, and, in exceedingly rare cases, even the uterus, and inside of that a fetus.

Diagnosis.—Inguinal hernia may be confounded with a swollen gland, hydrocele, or a tumor of the round ligament; but can be distinguished by its reducibility, its increase in size during coughing or abdominal pressure, clear percussion tone, a gurgling sound, and sensation of something slipping away when the protruded gut is being replaced. There are no signs of inflammatory action, and the tumor when examined with explorative aspiration, contains no fluid, or some mixed with fecal matter.

Treatment.—The treatment consists in reduction and the application of a truss, or preferably, in the radical operation, with closure of the inguinal canal. If an ovary is found in the sac, cannot be replaced, and causes pain, it is better to extirpate it.

If the hernia contains the pregnant uterus, the fetus may be carried to term in this abnormal situation; but if the case comes under observation early in pregnancy, the uterus should be removed by abdominal hysterectomy. At the end of pregnancy the uterus should be incised and the child delivered by Cæsarean section. The uterus may be closed and left till involution has diminished its volume and blood supply, or it may be replaced into the abdominal cavity, or, if that is impossible, amputated at the level of the internal os.

In little girls the intestine descends sometimes into the canal of Nuck, forming a hernia which corresponds to that of the tunica vaginalis in men. The treatment is the same as for other inguinal herniæ.

2. POSTERIOR LABIAL OR VAGINOLABIAL HERNIA.—In this variety the intestine descends in front of the uterus, along the vagina and the bladder, and enters the labium from behind. Its course corresponds with the ascending branch of the ischium.

Diagnosis.—It is distinguished from the inguinal hernia by being placed farther back in the labium. The space between it and the external inguinal ring, as well as the inguinal canal, is free, and taxis can be accomplished only in the direction of the vagina.

Treatment.—The hernia should be replaced along the route of its descent, but it is difficult to retain it. The best is to make a circular

denudation in the vagina, double it up, suture it, and, after healing, insert a Gariel's air pessary.

§ 3. Tumors connected with the Extra-pelvic Portion of the Round Ligament.—The chief tumors found here are *hydrocele* and *fibroma*.

1. HYDROCELE is an accumulation of serum in connection with that portion of the round ligament which lies in or outside of the inguinal canal. It is a rare disease. The fluid may be contained in the canal of Nuck, in the surrounding connective tissue, or in the interior of the ligament. If the fluid is found in the peritoneal prolongation formed by the canal of Nuck, this may be in open communication with the peritoneal cavity, or it may be shut off from it by adhesion. The sac is covered by the skin, the superficial fascia, and the fascia transversalis. The fluid is ordinarily serous, but may be mixed with blood or become purulent. It begins as a small, painless swelling in the inguinal canal and extends slowly to the anterior part of the labium majus. It may be found on both sides. At first it disappears in the recumbent position or on pressure. When the sac is closed by adhesion, the tumor is immovable, elastic, translucent, not very tender. It may acquire the size of the fetal head at term and may interfere with locomotion, copulation, or childbirth.

Diagnosis.—The chief error liable to be made is to confound hydrocele with *hernia*; but hydrocele differs from it by being produced slowly. If there is communication with the abdominal cavity, the hydrocele disappears when the patient lies on her back or when pressure is exercised on the tumor, and no sound is produced, nor is any solid body felt slipping under the fingers. If the sac is closed, the tumor cannot be made to disappear by taxis. The translucency is also characteristic. If the hydrocele becomes inflamed, it may cause vomiting, but never constipation, as does a strangulated hernia.

Treatment.—If the sac communicates with the abdominal cavity, the fluid should be pressed back and a truss applied until the walls adhere to each other. If the sac is closed, the contents may be aspirated; but this rarely suffices for a cure. It is better to combine the aspiration with the injection of 20 minims (120 centigrammes) of tincture of iodine or carbolic acid with a hypodermic syringe through a long needle, which produce adhesive inflammation. For safety's sake the inguinal canal should be compressed during the injection, and the injected fluid should be withdrawn again with the syringe after having been moved over the whole interior of the sac. If this mild

treatment does not succeed, the cavity should be laid open and packed with iodoform gauze until it fills by granulation. If the sac is very old and thick, it may be extirpated. If the fluid is purulent or sanious, the sac must be incised and treated with antiseptics before packing it,—for instance, painted with pure carbolic acid, washed off with alcohol.

2. FIBROMA OF THE ROUND LIGAMENT.—A fibromyomatous tumor may form anywhere in the course of the round ligament, most commonly in its external portion. It forms a globular, hard, painless mass, varying in size from a walnut to a cocoanut, and covered with normal skin. In the beginning it is a little movable, and sometimes it has a pedicle extending into the inguinal canal. It grows slowly.

The *diagnosis* is not always easy. *Ovarian hernia* is softer and more sensitive. *Intestinal hernia* is also softer; more sensitive; may, as a rule, be replaced with the above-mentioned characteristic sound and sensation; and increases by bearing down. *Hydrocele* is more elastic and translucent. *Adenitis* and *sarcoma* affect, as a rule, several glands and are immovable. *Diffuse fibroma of the vulva* is also immovable and begins in the labium.

Prognosis.—The tumor is benign, but may be an obstacle to coition, and otherwise inconvenient by its bulk.

Treatment.—An incision is made in the longest diameter, the neoplasm shelled out, and the pedicle tied, cut, and comprised in the sutures by which the wound is closed.

§ 4. Injuries.—The vulva, especially the labia majora, may be wounded by falls, blows, or kicks. On account of the sharp edge of the pubic arch, even the wound produced by contact with a blunt object may have the appearance of being incised.

Coition in childhood or old age may lead to injury, due to disproportion in size with the male organ or lack of elasticity. By far the most common cause is parturition.¹

If the skin remains unbroken, blood may collect under it, forming a *hæmatoma*, which may be resorbed or suppurate. An open wound, even of small dimensions, may, on account of connection with the pelvic veins and the absence of valves in them, give rise to serious and even fatal hemorrhage.

Treatment.—If the skin is unbroken, pain in the contused part is relieved by the application of pads soaked in hot water, to which may be added tincture of opium, tincture of arnica, and fluid extract of

¹ Garrigues, "Text-book of Obstetrics," 1902, p. 536.

hamamelis (a teaspoonful of each to a cup of water). Later cooling astringent solutions are substituted, such as liq. plumbi subacetatis, tinct. opii, āā ℥ss to ℥viii (15 grammes to 240 grammes) of water. If there is a hæmatoma of such dimensions that resorption cannot be expected, it is best to keep a colpeurynter filled with ice-water in the vagina, and make compression on the skin with pads and a T-bandage for three or four days. Then an incision is made on the mucous membrane of the labium near and parallel to the lower edge. The clots are turned out and spurting arteries tied. If there is oozing, the bleeding surface should be seared with the thermocautery or strewn with powdered suprarenal capsule. Finally, the cavity is packed with iodoform gauze, which is renewed every day, when the cavity is washed out with antiseptic fluid, preferably creolin, on account of its hæmostatic power. If the hæmatoma suppurates, it should likewise be opened and disinfected.

If the skin is broken and there is only a slight tear, the use of the lead-and-opium wash may be followed by the application of iodoform ointment :

R Iodoformi ;
Balsami peruviani, āā ℥i (4 grammes) ;
Vaselini, ℥i (30 grammes).—M.

If there is any hemorrhage, its source should be carefully looked for, spurting arteries tied or twisted, and oozing surfaces united by deep sutures. For this purpose it may be necessary to dilate the opening with a knife. If bleeding continues, the wound should be covered with styptic cotton or suprarenal capsule powder, the vagina and vulva tamponed, and compression exercised on the skin. If the contusion has been severe enough to cause mortification, the dead tissue should be cut away as soon as a line of demarcation has been formed, and granulation favored by the employment of a 10 per cent. camphor emulsion :

R Camphoræ, ℥ss (15 grammes) ;
Mucilaginis acaciæ, ℥i (30 grammes) ;
Aquæ, q. s. ad ℥v (150 grammes).

Later, iodoform ointment may be substituted.

§ 5. *Ædœitis*, or *Vulvitis*.—*Ædœitis* is inflammation of the vulva, in Greek called *αἰδοῖνο*. There are five varieties : the *catarrhal*, the *follicular*, the *phlegmonous*, the *venereal*, and the *diphtheritic*.

Etiology.—The causes of the catarrhal and the follicular forms are lack of cleanliness, acrid discharge from the vagina, a vesicovaginal fistula, masturbation, venereal excesses, rape, in fat women friction in walking, or the presence of pin-worms or ants. The scrofulous diathesis acts as a predisposing cause, especially in children. The phlegmonous form may develop from the catarrhal, but is commonly due to violence. The venereal is produced by one of the three venereal diseases—gonorrhœa, chancre, or syphilis. The diphtheritic occurs in grave diseases, such as puerperal infection, scarlet fever, typhoid fever, and smallpox. It is most often produced by streptococci, but sometimes the true bacillus diphtheriæ of Klebs and Löffler is found.

Symptoms.—The *catarrhal œdœitis* is either *acute* or *chronic*, frequently the first. In the *acute* form the mucous membrane is

swollen, and secretes a mucous fluid. The patient complains of itching and has an unpleasant sensation of heat, which during micturition increases to burning. In the *chronic* form the color is less red, and there are often abraded superficial ulcers, which may bleed. The skin on the outside of the labia is excoriated. The labia swell sometimes. The patient is awake and restless at night.

FIG. 126.



Follicular Ædœitis. (Huguier.)

with little round, red protuberances, the size of a pin-head (Fig. 126). Often a hair arises in the center of each follicle, which may be pressed out from the sheath.

Phlegmonous œdœitis is characterized by a more intense inflammation to the subcutaneous and submucous tissues. Deep abscesses and sloughs may develop and the patient is feverish.

Follicular œdœitis is a disease of the labia minora, the sheath of the hair, the sebaceous glands, or the mucous glands, or the mucous membrane of the labia majora and minora.

The *venereal* forms will be described below, under **VENEREAL DISEASES**.

In the *diphtheritic* variety there are yellowish patches of infiltration. The tissue is oedematous, dark red, brown, or greenish. The temperature is high and the pulse frequent.

Prognosis.—The acute catarrhal and follicular varieties are not dangerous and are soon cured. The chronic catarrhal form may be very protracted. The phlegmonous is a serious affection, and the diphtheritic is found only in very dangerous diseases. It may end in death or cause local destruction and formation of cicatrices which impair the normal functions of the genitals.

Treatment.—If the patient has fever with the milder forms, she should be kept in bed, on scant diet, and have a saline aperient and tincture of aconite root. The genitals should be kept clean with lukewarm ablutions or injections of antiseptics or hot or lukewarm sitz baths, and covered with cloths soaked in the same solutions, a fine piece being placed between the labia. When the acutest stage has passed, lead-and-opium wash may be substituted. Still later the mucous membrane may be painted two or three times a day with Monsell's solution of sulphate of iron, or liq. ferri chloridi, each diluted with 8 times as much glycerin. The inflamed surfaces may be swabbed every other day with a solution of nitrate of silver—gr. x to ʒi (2 per cent.)—or liq. iodi co., diluted with 2 parts of distilled water. When the inflammation has nearly subsided, dry powders are substituted, such as stearate of zinc, subnitrate of bismuth, aristol, lycopodium, or talcum. These powders are also used for the intertrigo.

If the urine is hyperacid, alkalies should be given, for instance :

R Tinct. belladonnæ, ʒii (8 grammes) ;

Liq. potassæ, ʒi (30 grammes) ;

Aquæ dest., q. s. ad ʒiv (120 grammes).—M.

Sig.—A teaspoonful in a wineglassful of water three times a day.

If it is alkaline, the saturated solution of boric acid, benzoate of ammonium or sodium, or Horsford's acid phosphates should be prescribed.

Itching is relieved by chloral hydrate, camphor, or hydrocyanic acid.

R Chlorali hydratis, ʒi-ii (4-8 grammes) ;

Vaselini, ʒii (60 grammes).

- R Chlorali hydratis,
Camphoræ, āā 3i (4 grammes) ;
Vaselini, 3ii (60 grammes).
- R Ac. hydrocyan. dilut., 3ii (8 grammes) ;
Plumbi acetat., ʒii (250 centigrammes) ;
Glycerini, 3ii (60 grammes).
- R Chlorali hydratis,
Camphoræ, āā 3ii (8 grammes) ;
Acidi oleici, 3ii (60 grammes).

In extreme cases the whole mucous membrane is excised.

In the phlegmonous variety abscesses are laid open with incision, washed with antiseptic fluid, and packed with iodoform gauze.

Diphtheritic patches should be cauterized with chloride of zinc, dissolved in equal parts of distilled water, which is repeated daily if the diphtheritic process spreads, and kept clean with antiseptic fluid. During the healing process, deformities should be avoided as much as possible by stretching and dilating the granulating surfaces.

§ 6. **Gangrene of the Vulva.**—The vulva may become gangrenous in consequence of contusion, œdema, hæmatoma, or diphtheritic infiltration. In children is found an *idiopathic* gangrene like noma. It begins as a white blister, which ruptures and forms an ulcer that becomes diphtheritic, and finally mortification sets in. The disease is contagious.

Treatment.—The affected place should be thoroughly cauterized with a 50 per cent. solution of chloride of zinc or the thermocautery and kept clean with antiseptic fluids, as in œdœitis. Tonics should be administered internally, and the dead tissues cut away as soon as a line of demarcation is developed.

§ 7. **Herpes Progenitalis.**—An herpetic eruption may take place on the skin or the mucous membrane of the vulva. Generally it is preceded by a burning or itching sensation. It consists of one or more vesicles or groups of vesicles. First a red spot appears, and is followed by a vesicle filled with serum and varying in size from a pin-head to a hemp-seed. On the skin the vesicles dry up and form a scab; on the mucous membrane they give rise to a shallow ulcer. The floor is of a deep rosy red, with a finely uneven surface and sharply cut, sometimes undermined, edges. In some cases the eruption is accompanied by considerable œdema. It stands a week or two and ends in recovery. Occasionally it leads to the formation of a bubo.

Etiology.—It is only found in adults, particularly prostitutes. It appears often synchronously with menstruation, and is due to congestion.

Diagnosis.—The ulcer is more superficial than a *chancroid*. It may be much like the primary lesion of syphilis, but has not the copper color and the smooth floor of a *chancre*. Its areola is very slight, and there is no inflammation of the surrounding tissue. In the vesicular stage fluid may be pressed out, which is not the case with a chancre. The history may throw light on the nature of the eruption, and the course will soon dispel every doubt in this respect.

Treatment.—The affected part should be covered with lint soaked in diluted carbolic acid.

R Ac. carbolici, ℥xl (250 centigrammes);
Glycerini, ℥ss (15 grammes);
Aquæ, q. s. ad ℥iv (120 grammes).

The dry powders mentioned under *ædœitis* are also good. Pain may be relieved with iodoform ointment. If it persists, the ulcer should be touched with undiluted carbolic acid, washed off with alcohol, or it may be swabbed with a solution of nitrate of silver (1 : 8), followed by lead-and-opium wash.

§ 8. *Trichiasis*.—This is a rare disease, which causes intense itching. It is due to inversion of the pubic hairs against the mucous membrane. The hairs in question must be eradicated and their bulbs destroyed with electrolysis.

§ 9. *Pruritus Vulvæ*.—By this name is designated a condition characterized by itching of the vulva, sometimes extending to the vagina and the lower part of the abdominal wall. It may be *symptomatic* or *idiopathic*. The symptomatic itching may be due to a disease of the genitals, especially *ædœitis*, *eczema*, or *trichiasis*, or be a reflex from disturbances in neighboring or more remote organs, such as *hæmorrhoids*, *pin-worms*, diseases of the urinary organs, or congestion of the pelvis. It may be caused by discharge from the vagina, diabetes mellitus, gout, or general nervousness. It is more common in old age, and appears often in pregnancy, at the menstrual period, or at the climacteric. Sometimes it is produced by lice or *acarus scabiei*. When no other cause can be found, it is supposed to emanate from the nerve-centres.

The itching tempts irresistibly to scratching, which gives momentary

relief, but increases the itching and leads to eczema. Sleep is disturbed. The nutrition suffers. The mental functions are deranged, and in her despair the poor sufferer may commit suicide. The itching increases by heat, and is therefore worse at night and during exercise.

Prognosis.—If there is a cause that can be removed, the disease is quite amenable to treatment; if not, it may be very obstinate.

Treatment.—The treatment must, first of all, be directed against the cause. Locally, painting two or three times a week with a 5 per cent. solution of nitrate of silver and the application between the labia of fine rags soaked in a solution of acetate of lead (see p. 126), to be changed half a dozen times a day, are very effective. This should be combined with carbolized vaginal douches. If crab-lice have lodged in the pubic hairs, these should be shaved off and the part smeared with balsam of Peru or blue ointment, or washed with a strong solution of bichloride of mercury:

R Hydrargyri chloridi corrosivi, gr. i. (6 centigrammes);
Alcohol,
Aquæ, āā ʒss (15 grammes).—M.

Besides, warm general baths, with 2 drachms (8 grammes) of the same drug, should be taken daily until all parasites are gone. If the itching is caused by *acarus scabiei*, a general cure for itch will probably be needed, and should be combined with the local use of sulphur ointment or beta-naphthol vaseline (5 per cent.). Eczema is treated with resinol, unguentine, or a modified unguentum diachylon:

R Plumbi oxidi, 1 part;
Ol. olivæ, 3 parts;
Aquæ, 4 parts.—M.

Sig.—Boil over slow fire to the consistency of cream.

Pin-worms are removed from the rectum by the internal use of extractum *sefinæ* et *spigeliæ* fluidum and clysters of infusion of *quassia* (1 : 8), or solution of corrosive sublimate (1 : 8000).

The diet must be bland. Alcoholic drinks, coffee, spiced dishes, and pickles must be absolutely forbidden. The patient should drink two or three quarts of milk a day.

It is often necessary to combat sleeplessness with hypnotics. Arsenic, quinine, and bromides tranquillize the nervous system. Some praise the galvanic current. In the most obstinate cases the mucous membrane must be cut away.

Burning sensation in the genitals and abdomen is as frequent as itching and much less influenced by therapeutic measures. Bromides internally and cold applications give most relief.

§ 10. *Hyperæsthesia of the Vulva*.—This is a rather rare disease. It is characterized by a morbid sensitiveness of the vulva. It differs from pruritus by the absence of itching and from vaginismus by that of spasm. It appears mostly at the menopause. Hysteria and despondency predispose to it, and it is not easily cured.

Treatment.—Sexual intercourse must be forbidden. The patient should be sent to the country in cheerful surroundings. Sea baths, warm general baths, hot sitz baths have a soothing influence. Similar applications as for vulvitis and pruritus should be made.

§ 11. *Tumors of the Vulva*.—A. *Hyperplasia*.—Parts of the vulva, especially the clitoris and the labia majora, may assume abnormally large proportions (see above).

B. *Varicose Veins*.—The veins of the vulva, particularly those of the labia majora, may form globular or serpentine dark-blue prominences which may reach the size of a fetal head at term. They are soft and collapse on pressure, but refill immediately. They may cause inconvenience by their size and weight and sometimes give rise to itching. The affection is most common in pregnancy,¹ but may remain after it or be found independently of it. A varix may rupture and cause dangerous or fatal hemorrhage.

Treatment.—Rest; application of lead-and-opium wash; and compression, beginning from the legs. If rupture occurs, the hemorrhage should be checked with deep sutures, a vaginal tampon, and external compression, as in hæmatoma (p. 123).

C. *Hæmatoma*, or *thrombus*, is an accumulation of blood in the connective tissue. It may be due to ruptured varicose veins, injury, or childbirth.² The treatment is described on p. 123.

D. *Papilloma*.—Papilloma is a tumor produced by the hyperplasia of the papillæ of the skin or mucous membrane with corresponding development of blood-vessels and epidermis. On the female genitals there are three varieties,—namely, *common warts*, *vegetations*, and *mucous patches*.

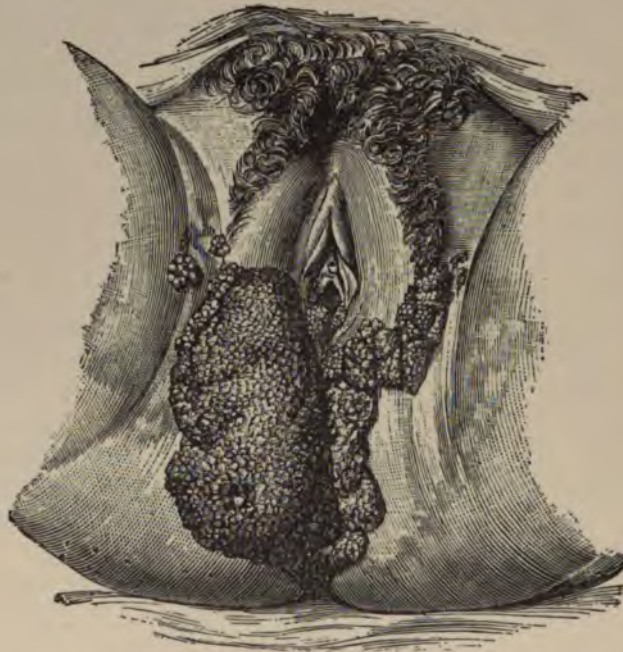
Common warts may be found on the vulva, especially the mons veneris, as well as in other localities. They form small, hard, more or less pediculated, brown tumors without importance.

¹ Garrigues, "Obstetrics," 1902, p. 291.

² Ibid., p. 292.

Vegetations, venereal warts, or condylomata acuminata, are exclusively found on or near the genitals of both sexes. They may occupy the vulva, the vagina, and vaginal portion of the uterus, or be situated around the anus and on the inside of the thighs. They begin as small erosions, which become elevated as papules and form sessile or pedunculated tumors of grayish or purple color. They vary in size from a hemp-seed to a raspberry, but different isolated protuberances coming in contact with one another, they may constitute a mass

FIG. 127.



Vegetations of vulva and perineum. (Tarnier and Budin.)

the size of a fetal head at term. The surface is always the seat of deep furrows, and the whole growth can be separated into smaller cauliflower-like portions (Fig. 127). On the skin they are somewhat hard, like common warts; on the mucous membrane they are softer. They secrete an acrid fluid of sickening odor and may obstruct micturition, defecation, copulation, and childbirth. After being destroyed they are very apt to reappear. They may become gangrenous, and in old age they have a tendency to turn malignant. Their secretion may cause ophthalmia. They may be due to simple lack of

cleanliness, but are much more common in connection with gonorrhœa or other venereal disease.

Diagnosis.—When flat and sessile, they may resemble *mucous patches*; but these are few in number, do not acquire such large dimensions, and are combined with other signs of syphilis.

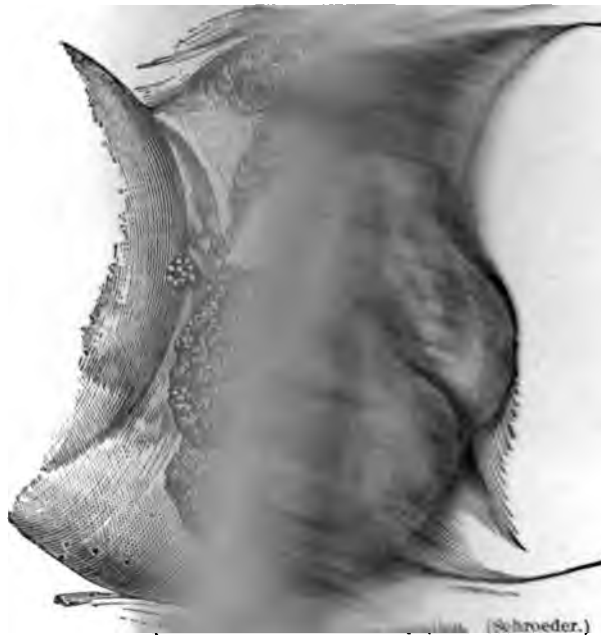
Treatment.—Small venereal warts may be cut off with curved scissors; or they may be destroyed with corrosive-sublimate collodium (3ss to ʒi—2 grammes to 30); salicylic-acid collodium (ʒi to ʒi—4 grammes to 30); glacial acetic acid; lactic, nitric, or chromic acid; or liquor antimonii trichlorati (butter of antimony). But the best is to remove them and their base with Paquelin's cautery. Tannin, alum, equal parts of calomel and salicylic acid, or liquor ferri chloridi makes them shrink, which is advisable before attacking them surgically. Medium-sized tumors, up to an inch in diameter, may be tied off with silk or rubber thread. Still larger ones must be removed with the thermocautery or the galvano-caustic wire, at dull-red heat. It is not safe to cut them off with knife, scissors, or écraseur, since there may come troublesome hemorrhage. Besides destroying the tumors, sitz baths, antiseptic vaginal injections, and applications of pads moistened with the same should be prescribed.

Mucous patches will be considered under VENEREAL DISEASES.

E. *Elephantiasis*, or *pachydermia* (Figs. 128, 129), is a chronic recurring lymphangitis, combined with hyperplasia of the skin, the mucous membrane, and the epidermis, which may result in enormous tumors. The disease is rare in North America and Europe, but endemic in the West Indies, the coasts of Central and South America, in Africa, and on the islands of the Pacific. It is found in adults, but seems to begin in childhood. The negress is more frequently affected by it than the white woman. It develops in marshy localities, and is generally due to the presence of a parasite—the *filaria sanguinis*—in the blood, where it probably is introduced by mosquitoes. The disease may be due also to primary occlusion of the lymph-vessels and destruction of the inguinal glands. It begins as a common lymphangitis, with fever and red streaks leading from the vulva to the glands; but this acute stage, which lasts a week or two, leaves an œdema. New attacks follow, with intervals varying from a month to several years, and at each recrudescence the part becomes harder, until finally it is like the rind of ham in consistency, dark brown, often studded with warts, furrowed by fissures, or the seat of ulcers, from which oozes a serous fluid. The tumors may hang down to the knees or even to the ankles.

Vegetations, venereal warts, or condylomata, are found on or near the genitals of both sexes. They are found on the vulva, the vagina, and vaginal port; around the anus and on the inside of the thighs. They are small erosions, which become enlarged, and form pedunculated tumors of grayish color, varying in size from a hemp-seed to a raspberry. They are caused by the frictions coming in contact with one

another during coition; and are sometimes exceptionally, combined with gonorrhea. They are covered with acanthocytes, and are removed by the use of the skin, by the use of the microscope.



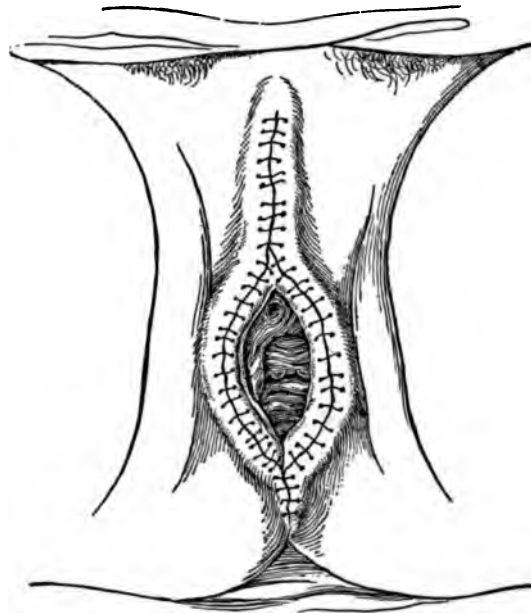
Vegetation

the size of a fetal head, and deep furrows, and the cauliflower-like port. They are hard, like common warts. They are so rare, and are not a true venereal disease. If destroyed they are very painful, and in old age they may cause op-

pression of the vessels and numerous yellow spots. The disease, and can be cured by the use of the microscope. It does not imperil life, and is not a venereal disease, and pyemia supervene. The condition is treated like gonorrhea, and cooling, astringent local treatment. In young subjects the disease is not effective, and may be com-

bined with massage and electrolysis. In old cases amputation is the only remedy. As there may be considerable hemorrhage, it is best to transfix the base with steel pins and surround it with a rubber constrictor above the pins. Vessels seen on the cut surface should be picked up and tied with catgut and the wound closed with deep and superficial sutures. The tumor may be removed also by the galvano-caustic wire or the thermocautery; but then one loses the advantage of primary union.

FIG. 129.



Elephantiasis of the vulva, after operation. (Schroeder.)

F. *Fibroma*.—A fibroma, or *fibroid*, is a tumor composed of fibrous connective tissue. It may be *diffuse* or *circumscribed*. The cause is unknown. The *diffuse* implicates more or less of the whole vulva. It forms nodular tumors that often branch off into lateral growths. They are not sensitive or painful and do not ulcerate except when exposed to friction. They grow slowly and may become very large. They cause discomfort by their weight and size and prevent coition, but do not undermine the constitution. The disease resembles elephantiasis, but the growth develops in the subcutaneous and submucous connective tissue without implicating the skin and mucous

membrane, and the histological composition differs. The tumor is composed of fibrous connective tissue and contains small round cells around the blood-vessels, no dilated lymph-vessels or elastic fibres. The only treatment consists in amputation, which is performed as described above, under *Elephantiasis*.

The *circumscribed* form is rare. The tumor soon becomes pedunculated and hangs down from the labium majus. The *treatment* consists in severing the pedicle, tying the artery found in it, and uniting the edges with sutures.

G. *Myoma, Myxoma, and Lipoma*.—Tumors like fibromas in outer appearance may be composed of unstripped muscle fibres (*myoma*), myxomatous or adipose tissue, often combined with fibrous tissue—*myofibroma*, *myxofibroma*, or *fibrous lipoma*. They are all benign, but the only treatment consists in amputation.

H. *Urethral Caruncle, Angioma, Neuroma of the Vulva*.—A caruncle is a small tumor situated in or near the meatus urinarius. It is sessile or pediculated, of bright red color, the size varying from a hemp-seed to a cherry. Often it does not give rise to any symptoms, but in some cases it is exquisitely painful to touch and during micturition. The microscope shows that it is composed of dilated capillaries and sometimes is rich in nerve fibrillæ.

Diagnosis.—Carunculæ differ from *vegetations* by their seat near the urethra; their even, globular surface; their bright red color; and in some instances by their exquisite sensitiveness.

Treatment.—If they do not inconvenience the patient, they may be left alone. If they cause pain, they should be removed. A pedunculated tumor may be seized with forceps and twisted off. The sessile ones may be destroyed with nitric or chromic acid, followed by a solution of bicarbonate of sodium; or with Paquelin's cautery. If the tumor is situated in the interior of the urethra, this must be dilated with a urethral speculum. As all these procedures are painful, the part should be anæsthetized with a 10 per cent. solution of cocaine hydrochlorate.

I. *Cysts*.—Except those situated in the vulvovaginal glands, which will be considered later, vulvar cysts are rather rare. They range in size from a pea to a fetal head at term. If small, they give rise to no symptoms; if large, they are troublesome by their bulk and weight and interfere with copulation. Some of them are dermoids and contain hairs, bones, and oily fluid. Others result from hæmatomas. Others again are atheromas due to obstruction of the outlet of a

sebaceous gland or expansions of lymph-vessels. Most of them contain a serous fluid. They may become inflamed, and are then sensitive and accompanied by fever.

Treatment.—If they are not easily shelled out, part of the wall is excised, the remainder seared with the thermocautery, and the cavity packed with iodoform gauze, which is renewed daily till the hollow fills with granulations.

J. Cancer.—The vulva is not very frequently the seat of malignant disease; but it may be affected by epithelioma, medullary carcinoma,

FIG. 130.



Epithelioma of the vulva. (Zweifel.) *a*, clitoris; *b*, fossa navicularis; *c*, entrance to the vagina; *d*, torn perineum; *gg*, cancerous nodules in the skin of the mons Veneris.

scirrhus, sarcoma, or melanosarcoma. These are all destructive locally, undermine the general health, and may end in death. Epithelioma (Fig. 130) is in so far comparatively benign, as its course is slower.

Etiology.—As in other regions, the true cause of cancer of the vulva is unknown. It is mostly found in advanced age. Psoriasis,

urethral caruncles, warts, and vegetations in elderly persons have a tendency to degenerate to cancer.

Symptoms.—Small nodules form in the skin or mucous membrane, become exulcerated, and often the seat of exuberant growth, which gives them the appearance of raspberries. The inguinal glands become soon infiltrated. Sometimes the patient complains of distressing itching, later there is pain. The ulcers secrete a malodorous fluid and are apt to bleed. The degeneration spreads. It has no tendency to encroach upon the urethra or vagina, but may obstruct these canals. Sometimes the surrounding tissue becomes as hard as a board.

Prognosis.—The patient generally dies at the end of two or three years.

Diagnosis.—In so-called *lupus* the ulcers heal in one place while new ones develop. The inguinal glands are implicated later or not at all. The general health is unimpaired. *Chancroid* is acute, has sharper perpendicular edges, and is more rapidly accompanied by a bubo. *Chancre* is somewhat like a cancerous ulcer and is indurated; but there is a specific history, the indolent adenitis appears much sooner, and skin eruptions and other symptoms of syphilis follow. *Mucous patches* are not destructive and disappear rapidly under local and general treatment.

Treatment.—Nodules and ulcers should be cut out as soon as possible and in a wide circumference. The wound should be united with deep sutures. If the urethra is implicated, as much of it as possible should be left, in order to prevent incontinence. The inguinal glands should be enucleated. If the local destruction is so wide-spread that the wound cannot be closed, the neoplasm may be destroyed with the thermocautery, galvanocautery, or perhaps by Röntgen rays.

K. *Lupus, Esthiomène, Ulcus rodens, Chronic Inflammation, Infiltration, and Ulceration.*—This is a rare disease, only found in prostitutes. It is characterized by a combination of slowly developing ulcers and the formation of tumors in the vulvo-anal region (Fig. 131).

According to Robert Koch, *lupus* is tuberculosis of the skin, but in most cases of the affection now under consideration the bacillus tuberculosis has been looked for in vain. There is a profuse infiltration of small round cells around the vessels, and in these clusters are found giant cells. As a rule, the disease develops on a syphilitic ground, but the ulcers are not syphilitic. They are not infectious and are not influenced by mercury or iodine. They cause great destruction and may penetrate the urethra, the bladder, or the rectum, in

which latter place they may produce a stricture. One ulcer may heal, while another develops. They are painless. The tumors are of purplish color and hard. The general health may remain good for a long time, and those who succumb usually die from stricture of the intestine or peritonitis.

Diagnosis.—In *epithelioma* the tissue is much harder. The ulcers appear on the surface of knobs, whereas in *lupus* they are found in

FIG. 131.



Lupus of the vulva. (Häberlin.)

fissures and at the base of the tumors. The inguinal glands are soon implicated. The secretion is offensive, that of lupus has little or no odor. The disease causes lancinating pain. The ulceration never heals, while in lupus there is a reparative process accompanying the destruction. The histological composition differs entirely,—*epithelioma* is formed of large, flat, epidermal cells, grouped in cancer nests; in *lupus* there is infiltration with small round cells and giant cells.

Treatment.—The indication is to remove tumors and heal ulcers. If possible the diseased tissue should be removed with the knife and the wound closed with suture. If not, it is destroyed with strong caustics, like nitric acid, or the actual cautery (see *Cancer*). When practical, the Finsen rays should be tried. Fistulous tracts may be laid open and healed with an elastic ligature. The parts should be kept clean with baths, ablutions, fomentations, and injections. A general tonic treatment with iron, arsenic, strychnine, cod-liver oil, terraline, etc., should be prescribed, and sometimes a specific antisyphilitic course is called for. After the ulcers are healed, plastic operations or the use of dilators may be necessary. If dilatation does not suffice, a urethral stricture may be cut lengthwise and the edges united transversely.

§ 12. *Tuberculosis.*—Strange enough, tuberculosis rarely attacks the vulva. It is usually combined with that of the uterus, the tubes, and the lungs. It forms ulcers with sharp edges and a sinuous contour, and is often surrounded by small yellow protuberances, composed of large polygonal cells, small round cells, and giant cells, in the interior of which may be seen tubercle bacilli. These are found also in the discharge from the ulcers.

Treatment.—The general health should be fortified by fresh air, sunshine, nutritious food, and tonic medicines. The ulcers should be scraped with a curette and treated with iodoform, tincture of iodine, and Finsen rays. If this does not accomplish a cure, the diseased tissue should be removed with the knife or destroyed by caustics or cautery, if the patient's general condition warrants such an operation. If she is far gone, it is better to limit one's self to the palliative treatment.

§ 13. *Progressive Atrophy of the Nymphæ, Kraurosis.*—This is a rare disease. It begins commonly at or after the menopause. Small red, depressed spots appear on the inside of the labia minora. They are tender to touch and prone to bleed. They may disappear in one place and be produced in another. They are followed by a contraction of the mucous membrane, the labia minora may disappear altogether, and the entrance to the vagina becomes so narrow that hardly a finger can be introduced. Copulation is painful or impossible. The mucous membrane is dry and cicatricial. The patient often suffers from itching or burning. Microscopic examination shows atrophy of the rete mucosum and the papillæ, the papillary layer is composed of straight fibres like a cicatrix, and the sebaceous and sudoriparous

glands disappear. The cause is unknown. It has been noticed that often some member of the family suffers from trachoma.

Treatment.—Application of a strong solution of carbolic acid and a pledget steeped in a saturated solution of acetate of lead. Ungu. hydrarg. oxidi flavi (gr. iv to vaseline, 3i—25 centigrammes to 30 grammes). Extirpation of the affected part and suture or destruction with cautery.

§ 14. Diseases of the Vulvovaginal Glands.—Bartholin's gland may be the seat of *catarrh*, *cystic degeneration*, or *abscess*.

A. *Catarrh* is rather rare. There is an increase of secretion, the mucous membrane around the opening of the duct is red. The duct itself may be so dilated that a uterine sound passes it, or the aperture may be obstructed. In the latter eventuality a retention cyst is developed. Sometimes the secretion accumulated in the interior of the gland may be thrown off by a kind of nocturnal emission, which weakens the nervous system.

Treatment.—If there is an obstruction, probes should be passed. Antiseptic and astringent fluids should be injected. If the patient suffers from emissions, it is best to enucleate the glands.

B. *Cysts* may be *superficial* or *deep*. The former are developed in the duct, the latter in the gland itself. They form globular, elastic tumors in the posterior part of the labium majus outside of and behind the entrance to the vagina. They may become as large as hen's eggs. If they are not inflamed, they are indolent, and the content is a fluid like the raw white of an egg; but by admixture of blood it may be brown; and if inflammation sets in, it becomes purulent. As a rule, the duct is closed, but sometimes the obstruction yields on pressure. The most common cause is gonorrhœal infection.

Diagnosis.—*Hydrocele* and *inguinal hernia* are situated farther forward and upward, and communicate with the inguinal canal. *Posterior labial hernia* can be replaced in the direction of the vagina. *Vulvar abscess* has less distinct limits, is sensitive, and is covered with red skin. *Abscess of the gland* is also tender on pressure, covered by red mucous membrane, fluctuating, and is accompanied by fever.

Treatment.—An indolent cyst that does not interfere with copulation may be left alone. The fluid may be drawn off altogether and undiluted tincture of iodine or 5 per cent. carbolic acid solution injected and withdrawn. The anterior wall may be cut out with curved scissors, a running catgut suture placed along the bleeding edge, the cavity washed out, and packed with iodoform gauze, which is renewed

Treatment

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§ 12.

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Treatment

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§ 13. Pro

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pened with a longitudinal in- cary, from the bulb backward, e. If the abscess, how- arulent discharge, it is better

these diseases generally acquired designated venereal, are *gonor-*

production produced by the gono- a diplococcus, composed of two bean; but the surface that below, and there is a clear space

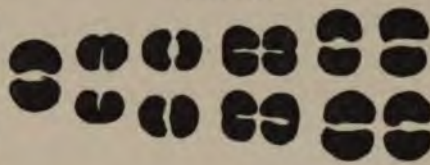
between the two which is wider than in other diplococci, and the bodies are larger. For a diagnosis it is, however, necessary also to see the way in which the cocci are grouped together. They form clusters, especially around the nucleus of pus-cells and on the surface of epithelial cells. The gonococcus is characterized also by being decolorized by Gram's method¹ and again stained by Bismarck brown.

Gonorrhœa being one, whether it is located in the vulva or extends throughout the genital tract, we shall consider it in its totality in this place. If artificially inoculated, the inflammation starts in a day or two, but it takes often from five to eight days or more before pain on micturition or stains on the linen bring the patient to apply for help. In most cases the disease is limited to the urethra, the vulva, and the vagina; but it may extend through the uterus and the tubes to the ovaries and peritoneum.

Gonorrhœal Urethritis.—The gonorrhœa affects nearly always the urethra. Sensitive patients may feel chilly at the outbreak. It causes a burning sensation,

which is much increased during micturition. There is frequent desire to urinate. Sometimes a few drops of blood are evacuated with the urine. Pus can be pressed out from the canal. The mucous membrane is red and swollen and sometimes everted. The urethra is swollen and tender on pressure. But the disease is apt to become chronic and then there are no subjective symptoms, but a mucopurulent or mucous fluid can be pressed out from the urethra and may

FIG. 132.



Shape and grouping of gonococcus. (Bumm.)

¹ *Gram's Method.*—The cover-glass smeared with the substance to be examined is passed quickly through the flame of an alcohol lamp and placed for from two to three minutes in a solution of gentian violet, prepared according to this formula: to 10 cubic centimetres of water add 2 cubic centimetres of anilin oil, shake well and filter through moist filter-paper. To the clear aniline water obtained add 1 cubic centimetre of 97 per cent. alcohol and 1 cubic centimetre of saturated solution of gentian violet. The excess of fluid is drained off from the cover-glass with filter-paper. Next, the cover-glass is placed for five minutes in Gram's iodine solution, which consists of iodine 1 part, iodide of potassium 2 parts, water 300 parts, and then placed directly into 97 per cent. alcohol, in order to wash out all the coloring matter.

contain gonococci. The inflammation very rarely extends to the bladder, the ureter, or the kidneys. The disease lasts about six weeks, the acute period from ten to fourteen days.

Gonorrhæal Ædæitis.—Primary gonorrhæal inflammation of the vulva is common in children, rare in adults, the cause of this difference being the delicacy of the epithelium in childhood compared with later life. But pus dribbling down from the urethra and the vagina may cause a secondary irritation in the vulva. The clitoris and labia minora are œdematous. The mucous membrane is red, bathed in pus, and shows sometimes pseudodiphtheritic membranes, under which are denuded bleeding surfaces. The inguinal glands swell and are sensitive. Sometimes there is eczema of the labia majora and the adjoining skin. The parts exhale an unpleasant odor. The inflammation subsides in the course of a week or two.

The small vulvar glands are often implicated, and may by retention form small yellow protuberances. In Bartholin's glands the process is nearly always limited to the ducts, where it may remain for years.

Gonorrhæal Colpitis.—The vagina, like the vulva, is frequently the seat of gonorrhœa in children, rarely in adults. In most grown-up persons the redness, swelling, and suppuration are due to a secondary irritation, caused by pus trickling down from the cervix. True gonococcus invasion is mostly located in the vault. The mucous membrane is swollen, red, smooth, sensitive, and bleeds readily. The secretion is first serous, then purulent. The lower abdomen is so tender that the patient hardly can walk, and the introduction of a speculum causes excruciating pain. The patient has fever. The affection is self-limiting in the course of three or four weeks. It never becomes chronic.

Gonorrhæal Metritis.—The cervix is, next to the urethra, the habitat of predilection of the gonococcus, which is comprehensible by its anatomical position, its narrowness, and its deep depressions. The vaginal portion is swollen, red, and sensitive. Thick greenish pus dribbles in abundance from the os, the mucous membrane of which appears as two red ridges, one above the other. The cervix is painful on pressure; but otherwise the symptoms are in many women not much marked, while others complain of a pain in the depth of the pelvis, the sacral region, or the whole abdomen. Cervical gonorrhœa causes less fever than the corporeal.

If the cavity of the uterus is involved, the symptoms are much more pronounced. There is always fever, which may even begin

with a chill. The patient suffers from a throbbing pelvic pain, which may culminate in attacks of cramps involving the bladder and the rectum. Attempts at bimanual examination or moving the uterus cause unbearable pain. The uterus is swollen, hard, and often anteverted or retroverted. This acute stage of suffering is, however, of short duration. In a week, or even a few days, pain and cramp may have disappeared and the patient be able to go about.

Cervical gonorrhœa is very apt to become chronic, when it is recognizable only by the discharge, which may become quite clear and glairy, but is full of gonococci. Sometimes there are erosions on the vaginal portion, and frequently exacerbations occur, when the discharge again may become purulent and the pains reappear in the pelvis. Corporeal gonorrhœa passes also often into the chronic form, in which it may remain for years, resisting all treatment, and still occasionally ending in spontaneous recovery. Menstruation is often profuse and too frequent.

Gonorrhœal Salpingitis.—The gonorrhœal infection may extend rapidly through the whole genital tract, reaching the tubes in from ten to fourteen days; but more commonly it remains for months or years limited to the uterus, before it, in consequence of some injury,—for instance, childbirth,—extends to the tubes. The implication of these organs is always accompanied by acute symptoms,—fever, sometimes a chill, pain in the sides of the lower abdomen, and sensitiveness on pressure. By examination under an anæsthetic the tubes are felt hard and stiff, but not much swollen. The acute stage is not of long duration, but a mucous discharge without gonococci continues indefinitely, the patients hardly ever regain complete health, and are generally sterile. In exceptional cases the tubes form large sacs filled with pus, which develop adhesions with the ovary, the omentum, and the intestines. In the course of time these tumors may become absorbed and the patient's sufferings be lessened.

Gonorrhœal Oöphoritis and Peritonitis.—The gonococci may be evacuated with pus from the tubes to the surface of the ovary and enter ruptured Graafian follicles, in which they form abscesses. The peritoneum in the neighborhood may become inflamed, but this process always remains local. Adhesions are developed which in the beginning are easily separated, but later become so hard that they can be severed only with sharp instruments. The attack of the peritoneum increases the sufferings of the patient very materially.

Gonorrhœal Proctitis.—The anus and rectum are frequently drawn

into the field of gonorrhœal invasion, as a rule through lack of cleanliness or direct mechanical introduction with syringes, thermometers, etc. The acute attack gives rise to considerable burning pain in the anal region. The mucous membrane is swollen, red, and sensitive, bleeds readily, and secretes pus. There are sometimes ulcerations. The rectal gonorrhœa may cease in the course of a few weeks or become chronic, which may lead to the formation of strictures, periproctitic abscesses, and fecal fistulæ.

Metastases.—Gonococci have been found in an inflamed joint and in endocarditic deposits accompanying gonorrhœa.

Latent Gonorrhœa.—Through intercourse with an apparently healthy man who has had a gonorrhœa months or years before, a woman does not get acute gonorrhœa, but she becomes ailing and sterile and has frequently recurrent attacks of inflammation of the inner genitals, a condition which has been designated latent gonorrhœa.

Prognosis.—Acute urethral and cervical gonorrhœa has a good prognosis, the disease tending towards extinction, even without treatment. The ascension to the tubes is rare, but if it occurs, serious. In the vulvar glands the infection may be reached and conquered. Chronic uterine gonorrhœa resists frequently all treatment, but ends sometimes spontaneously in recovery. Many women conceive and bear children in spite of chronic gonorrhœa, but during the lying-in period the gonococci increase enormously in number, and the infection may spread all the way to the peritoneum.¹ It often gives rise to secondary sterility. For the child the presence of gonococci in the maternal genital tract is of paramount importance, since it is liable to ophthalmia neonatorum and lifelong blindness.

Diagnosis.—The only absolutely sure sign is the presence of the gonococcus in the secretion. A drop of this is caught on a slide and covered with another, whereby it is spread in a thin layer. This is dried by exposure to the air or by passing it through the flame of an alcohol lamp. It is stained by immersing it for five minutes in carbol-fuchsin solution, washed off with water, dried again, and may then be examined with an oil immersion lens and preserved in Canada balsam under a cover-glass. The diplococcus may be distinguished from most other diplococci by its large size, its decoloration by Gram's method, and its subsequent staining with Bismarck brown. The gonococcus may also be cultivated.

¹ Garrigues, "Obstetrics," 1902, p. 719.

Other circumstances may help one to a conjectural diagnosis. Frequently the mere expression of the face and the timid behavior of the patient awaken suspicion as to the origin of her disease. The presence of a similar affection simultaneously in a mother and her child is also suspicious, but a purulent secretion from the genitals may be infectious without being gonorrhœal. The development of ophthalmia in the new-born is strong evidence of its having acquired the infection from its mother, if other sources can be excluded. Often the examination of the husband makes a diagnosis of gonorrhœa in the wife very probable. If he has a urethral discharge, or the lips of the meatus stick together in the morning, if there are threads, so-called "tripper-faden," in his urine, the presumption is that he has gonorrhœa; but it is not certain, for there may be a purulent discharge and threads in the urine that do not contain gonococci.

Treatment.—Much may be done in regard to *prophylaxis*. The source of the disease being chiefly prostitutes, these ought to be subjected to regular examinations with short intervals, and when found infected with gonococci, retained in special hospitals until perfectly cured. The male who has intercourse with a prostitute should use a rubber protector, so-called condom.¹ A treatment similar to that which has been such a blessing to mankind in preventing ophthalmia neonatorum has been found reliable. Immediately after coition with a prostitute, a few drops of a 2 per cent. nitrate of silver solution should be instilled into the meatus urinarius. The patient must be informed about the contagiousity of the secretion. Not only is coition absolutely forbidden, but she must every time she has touched her genitals wash her hands carefully with soap and water, and preferably disinfect them with corrosive sublimate (1 : 1000). She must use absorbent cotton for washing the vulva, and destroy the wadding. She must have a separate bed, syringe, and tub for sitz baths. She must particularly be warned to avoid carrying pus from the genitals to her eyes.

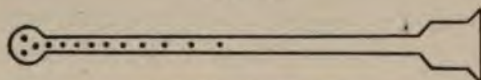
Curative Treatment.—Experience has shown that the gonorrhœa is more liable to extend to the bladder and the cavity of the uterine body if the mucous membrane is irritated. Furthermore, when the patient applies to the physician for treatment, the gonococcus has already penetrated so deep into the tissue that it cannot be killed by application of drugs to the surface. Besides, it is eliminated with the leucocytes in the

¹ Garrigues. "Protection for the Future Wife and Children," Amer. Medico-surgical Bulletin, October 31, 1896.

suppuration following. It is, therefore, an error to use astringents in the early part of the disease. On the other hand, it is, of course, desirable to kill the gonococci as soon as possible. The husband or another man with whom the patient has repeated relations should be examined, and if found infected, he should undergo treatment, as otherwise he is liable to reinfect her. If the disease begins with very acute symptoms,—fever, pain, oedema, and strangury,—the patient should be kept in bed, on bland diet, have a saline aperient, diuretic salts, such as acetate, citrate, and bitartrate of potassium, and drink plenty of water or demulcent drinks—linseed tea, almond milk, or French Vichy water. She should have a sitz bath of warm water or make affusions with chamomile tea or decoction of linseed every two hours and after each micturition.

When the acute symptoms subside or are little marked from the beginning, the urethra may be cleaned by means of a reflex catheter and plain warm water and then injected with a solution of protargol ($\frac{1}{4}$ to 1 per cent.) by means of Fritch's syringe (Fig. 133), taking care not to enter the bladder. The injection is made once or twice a day. The instrument is a common hypodermic syringe to which is screwed

FIG. 133.



Fritch's urethral syringe.

a thin tube ending in a little bulb and perforated with fine openings. Antibleb-norrhagic drugs, such as copaiba, cubeb, and sandal oil, do not kill the gon-

ococcus, but exert a useful influence on the mucous membrane in the later stages. Chronic urethritis demands treatment through the endoscope. Affected points are touched with a strong solution of silver nitrate (20–50 per cent.) or tincture of iodine or the galvanocautery.

Whether the vagina is affected or not, it should, after the most acute stage is passed, be irrigated with protargol solution ($\frac{1}{4}$ per cent.), and a tampon with ichthyol glycerin (10 to 20 per cent.) should be left in it, either as a preventive or as a curative measure. In the subacute stage a nitrate of silver solution (1 to 10 per cent.) is applied to the deep part of the vagina through a speculum, in children through catheter.

After the disappearance of the gonococci, antiseptic and astringent solutions—sulphocarbolate of zinc (1 per cent.), nitrate of silver (1:1000 for irrigation, 5 to 10 per cent. for swabbing or injecting,) corrosive sublimate (from 1:20,000 to 1:10,000)—should be employed, besides the continued use of the tampon.

Infected follicles in the vulva and meatus are destroyed singly with the galvanocautery, which is introduced cold and then made incandescent. When the glands of Bartholin are infected, their extirpation is the surest and most rapid remedy.

If the cervical canal is invaded, it is treated in a way similar to that applied to the urethra,—namely, with application of protargol or nitrate of silver solution. If necessary, the os is dilated or even dis-cised. After healing of the wounds, pledgets of absorbent cotton or gauze, soaked in ichthyol glycerin (5 to 10 per cent.), may be left for hours in the cervix.

For the treatment of the cavity of the body, the whole canal should be dilated, so as to insure free drainage. All secretion is wiped off and the endometrium swabbed with solutions of nitrate of silver or protargol (1 per cent.) or ichthyol glycerin (1 to 3 per cent.). When these applications are well borne, intra-uterine injections may be substituted. They should be made with silver nitrate (0.5–1 : 1000) or ichthyol (1 per cent.) and continued for 15 or 20 minutes under low pressure. Curettage is indicated only for profuse uterine hemorrhage. If the tubes are the seat of fresh or recent inflammation, nothing should be done in the body of the uterus, and even the cervix should be treated cautiously.

Chronic uterine gonorrhœa is treated with irrigation once daily and swabbing with tincture of iodine, nitrate of silver (10–20 per cent.), or chloride of zinc solution (20 per cent.) once a week.

Gonorrhœal salpingitis should be treated in a very expectant way. The patient should remain in bed for at least two months, until all pain has disappeared. Poultices, sitz baths, injections, tampons should not be used until months have elapsed since the last attack, and then tentatively. Massage should be postponed for years, but may then be used to advantage in separating adhesions.

When the tubes are changed to bags full of pus, with recurrent attacks of pelvic peritonitis, the uterus and adnexa should be removed by vaginal hysterectomy.

During pregnancy a chronic gonorrhœa should be treated with sitz baths and affusions only. A fresh infection which gives rise to much purulent secretion may be combatted with vaginal douches of plain water, but during the last weeks there would be danger of the water penetrating the uterus and carrying the gonococci along, then baths and ablutions must suffice. Suppurating vulvovaginal glands should be extirpated. Infection of the ducts may wait till after con-

finement. Even if she has no fever, the patient should be kept in bed for four or five weeks, and longer if there is rise in temperature. Intra-uterine douches and curettage are contraindicated.

2. CHANCROID, or SOFT CHANCER, is usually multiple in women. It is a contagious, inflammatory, destructive ulcer. On the mucous membrane it begins as a minute yellow spot, surrounded by a red ring. The epithelium is lifted so as to form a pustule, which ruptures and leaves an ulcer of round or oval shape, but by confluence of several the contour may become irregular. On the skin the ulcer may form without the development of a pustule. The edge is cut perpendicularly, as made with a puncher, minutely jagged, and more or less undermined. It is surrounded by a red area. The floor is uneven and covered with yellow débris. The secretion is yellow or brownish, and has a penetrating, nauseous odor. If properly treated, chancroids heal in a few weeks; if neglected, new ulcers continue to form, old ones spread, and the exhaustion may become fatal. Complications are less common than in men, even the development of a *bubo* is rare. Exceptionally the ulcer may, however, become *phagedenic*.

Chronic chancroid is a condition peculiar to women. It begins as a common chancre, but loses its infective power and causes hyperplasia of the surrounding tissue, when it is called *lupus*. It is entertained by uncleanness, gonorrhœal and leucorrhœal discharge, and drink.

Treatment.—The acute chancroid should be destroyed with undiluted carbolic acid, followed by alcohol, or by means of nitric acid or the thermocautery, under local anæsthesia with cocaine. The labia should be kept separated by the application of pieces of muslin dipped in a 2 per cent. solution of carbolic acid with a little glycerin. The vagina is kept clean with antiseptic injections. It is also well to dust the ulcer with iodoform, aristol, or salicylic acid mixed with from 4 to 8 parts of subnitrate of bismuth.

In *phagedena* the patient should have a nourishing diet and generous wine. The diseased tissue should be removed with the curette, and destroyed with the thermocautery, nitric acid, caustic potash, or bromine glycerin (1 part to 3). After that the patient should spend from eight to twelve hours daily in a warm sitz-bath (98°–102° F.).

Bubos are painted with tincture of iodine in the hope of resolving them. If they suppurate, they should be opened in their full length with an incision, washed out, packed with iodoform gauze, covered

with the same and sterilized gauze, and compression exercised with a spica, or more conveniently and effectively with Ricord's compressor, an oval pad of cork, held in place with a ribbon around thigh and pelvis. The dressing is changed daily. Broken-down tissue may be removed with the curette. When the cavity granulates, it may be dressed with iodoform ointment, balsam of Peru, or boric acid. Healing may be furthered with an occasional application of nitrate of silver (2-4 per cent.). In chronic cases the glands should be enucleated.

3. SYPHILIS.—The *primary lesion*, or *hard chancre*, is often not to be found on the female genitals. Frequently the infection takes place on the breasts or the lips, and even if it occurs on the genitals, it may be overlooked on account of its deep seat. There is little or no induration. The patient may not know that she has a chancre; it may heal; and secondary or tertiary symptoms may appear without any history of previous sores.

The *first period of incubation*—that is, the time elapsing between infection and the appearance of the chancre—lasts from ten to seventy days. The *second period of incubation*—the time from the formation of the primary lesion till the outbreak of constitutional syphilis—occupies from forty to seventy days. The two together generally last from two to three months. From five to ten days after the development of the chancre the inguinal glands begin to swell.

The syphilitic poison may come from a hard chancre, from secondary productions, especially mucous patches, or be inoculated with blood, lymph, or saliva. The primary lesion may be found on the vulva, on the vaginal portion of the uterus, or rarely on the wall of the vagina.

The primary lesion is a superficial, flat, reddish erosion, which soon changes into a round superficial ulcer of dark red or grayish color, with smooth floor and sparse serous secretion. Sometimes the base may be more or less hard. Often an infection with pyogenic microbes takes place simultaneously with the syphilitic inoculation. Then the secretion becomes purulent and the floor shows local gangrene. A chancre rarely becomes phagedenic. If the virus of soft chancre and that of the hard variety are inoculated at the same time, the chancroid develops first, and later changes to a hard chancre. This is called a *mixed chancre*.

The primary lesion is, as a rule, single, but may be multiple and mixed with soft chancres. It heals generally in a short time, but may exceptionally remain for months. It may disappear without leaving

any trace. Syphilitic adenitis consists of clusters of small, indolent, non-inflammatory glands; but if there is combination with pyogenic infection or chancroid, a bubo may form and suppurate.

The *diagnosis* is more difficult than in men. In *herpes proies* the inguinal glands are not affected, the base is soft, the contour is scalloped; the eruption itches; as a rule, the erosions are multiple, and heal readily. *Chancroid* is nearly always multiple; it forms a deep ulcer with abundant purulent discharge, its floor is yellow and uneven, its edges are perpendicular and undermined, the base is soft; the inguinal glands are not swollen or form an inflammatory bubo, with chancroidal or plain pus.

Treatment.—The ulcer should not be cauterized, but simply kept clean and dressed with a mild antiseptic solution of carbolic acid or bichloride of mercury. If it suppurates it should be dusted with iodoform, aristol, equal parts of calomel and bismuth subnitrate, or dressed with lotio hydrargyri nigra or flava. If the sore is covered with a pultaceous mass, it should be cauterized with carbolic acid, nitric acid, or a 50 per cent. solution of chloride of zinc. Phagedena is treated as described under chancroid, but at the same time a general antisyphilitic treatment is followed.

Secondary Syphilis.—*Mucous patches*, or *condylomata lata*, are frequently seen on the labia, less often on the vaginal portion of the uterus, and rarely on the wall of the vagina. On the vulva they form round or oval, grayish or red protuberances, that may coalesce and form large cauliflower-shaped excrescences, like vegetations, which may become gangrenous. On the vaginal portion mucous patches appear as small red erosions or superficial ulcers.

Treatment.—The growths should be touched with lunar caustic and a general mercurial treatment instituted.

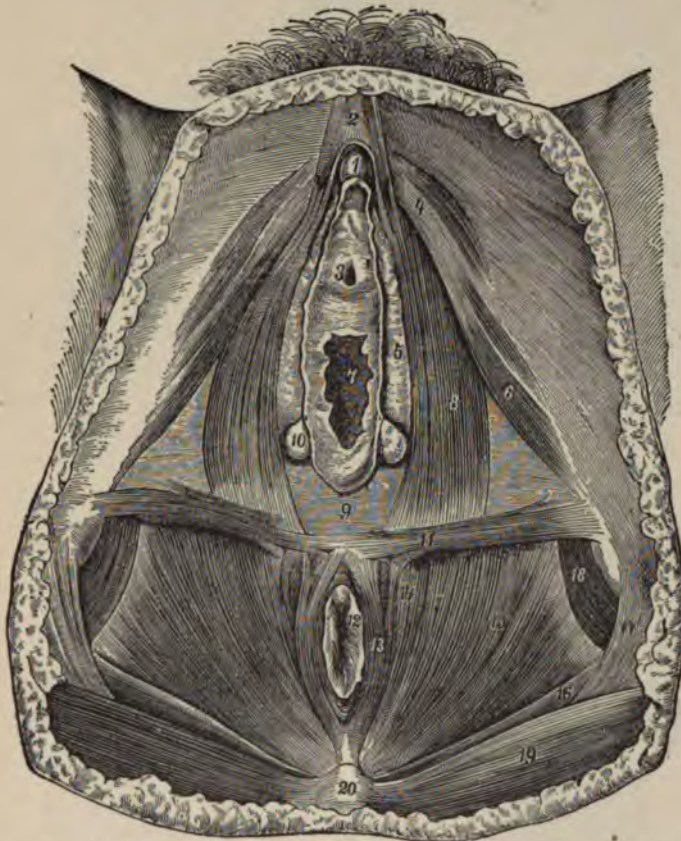
Tertiary Syphilis.—*Gummous tumors* are not rare in the labia, where they constitute deep-seated indolent swellings, which may ulcerate. The ulcers heal and the tumors are rapidly reabsorbed by the administration of iodide of potassium. Besides that, the ulcers should be kept clean and treated with one of the above-mentioned fluids or powders.

CHAPTER II

DISEASES OF THE PERINEUM

§ 1. Injuries.—Fig. 134 illustrates the muscles of the perineum. Fig. 135 represents a longitudinal section of the perineal body. Fig.

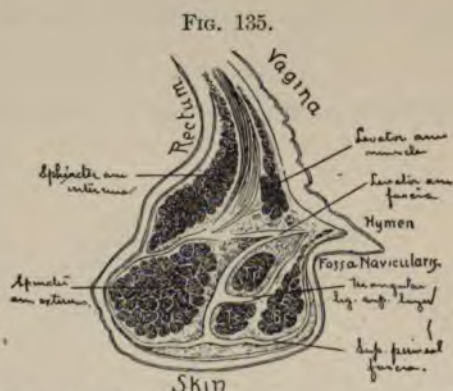
FIG. 134.



The muscles of the perineum. (Breisky.) 1, glans clitoridis; 2, corpus clitoridis; 3, meatus urinarius; 4, tendon of the ischiocavernosus muscle; 5, bulb; 6, ischio-cavernosus muscle; 7, vaginal entrance; 8, sphincter vaginae, or bulbocavernosus muscle; 9, fossa navicularis; 10, Bartholin's gland; 11, superficial transversus perinei muscle; 12, anus; 13, sphincter ani externus; 14, 15, levator ani muscle; 16, coccygeus muscle; 17, great sacrosciatic ligament; 18, obturator internus muscle; 19, gluteus maximus muscle; 20, os coccygis.

136 shows a dissection of the levator ani muscle. In Fig. 137 is seen a perpendicular section through the fasciæ of the perineum.

Injuries to the vulva have been considered above. The anal part of the perineum may be wounded from without or from within. The



Sagittal section through the perineal body (natural size). *B.c.*, bulbocavernosus muscle; *T.s.*, transversus perinaei superficialis muscle; *T.p.*, transversus perinaei profundus muscle.

lesions due to violence from without are like those of the vulva, are produced by similar causes, and are treated in the same way. Injuries from within are nearly always connected with childbirth and described



The levator ani muscle seen from below. (Dickinson.) The cut ends projecting inward are those which run into the rectovaginal septum.

in works on obstetrics.¹ Fresh tears should be united immediately with sutures. In rare cases even a complete laceration, implicating the rectum, may heal by simple cleanliness, rest, and a bandage holding the knees together. But, as a rule, the raw surfaces do not grow together, but simply heal up. The rima pudendi is extended behind. The perineal body is partially or totally torn. The levator ani muscle, with its two fasciæ, the anal below and the rectovesical above, are split, forming a V-shaped cleft, which generally is found to the right

FIG. 137



Pelvic and perineal fasciæ. (Dickinson.) Superficial perineal fascia, two layers; deep perineal fascia, or triangular ligament, two layers; the rectovesical, part of the pelvic fascia, and the levator ani fascia, or anal fascia.

of the median line, the occiput in childbirth usually escaping on the left side, while the broad forehead is still in the vagina and pressed against the posterior wall. The support of the genitals from below is defective, the anterior and posterior wall of the vagina, as well as the bladder, prolapse. The uterus may sink down or even protrude from the body. Often it is retroflexed. The patient complains of bearing-down pain and backache, in consequence of the strain on the liga-

¹ Garrigues, "Obstetrics," 1902, p. 536; "So-called Lacerations of the Perineum," Med. News, April 25, 1891.

ments attached to the uterus, and often of profuse menstruation and leucorrhœa, as well as various disturbances in the general system. If the tear implicates the rectum, the sphincter ani muscle is broken, a V-shaped rupture extends more or less up the intestine, and winds and loose fecal matter cannot be retained. The cicatrices shrink so that the parts become distorted. If the laceration does not enter the rectum, it is called *incomplete*; if this organ is invaded, the tear is named *complete*.

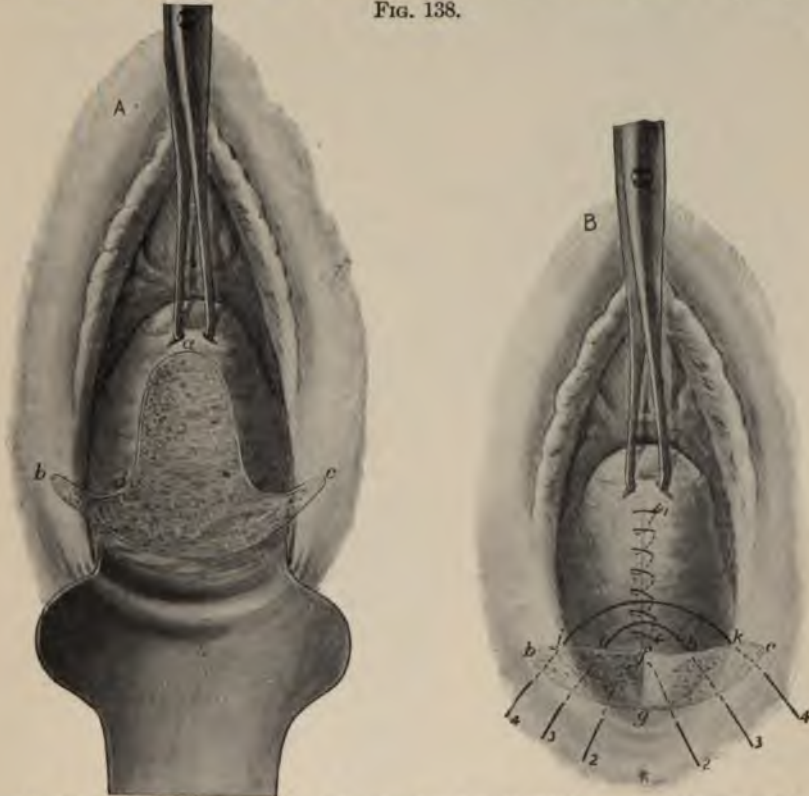
The *treatment* consists in an operation designated *perineorrhaphy*. On account of the cicatricial retraction, new surfaces must be obtained by borrowing from the surrounding tissue and parts brought in opposition which normally do not belong to each other. A large number of operations have been invented for the repair of old perineal laceration, of which here only a few will be described.

1. INCOMPLETE LACERATION.—(a) *Garrigues's Colpoperineorrhaphy* (Fig. 138)¹.—The object is to remove the whole thickness of the vaginal wall and the mucous membrane of the vulva over a surface on the posterior part of the vagina and vulva, bring the two halves together from side to side, and at the same time lift the posterior wall of the vagina up against the anterior. The anæsthetized patient is in the dorsal posture, with raised knees. According to the size of the prolapse of the posterior wall a point is chosen in the median line, more or less near the vaginal portion (Fig. 138, A, a). This is seized with a bullet-forceps with catch and pulled upward and forward. Small nicks (b and c) are made in the mucous membrane of the labia majora, near the edge, at such a distance that there is left proper space for copulation between them and the anterior wall. Imaginary S-shaped lines are drawn from these two points to the first, and where they intersect the lateral furrows of the vagina another pair of bullet-forceps is inserted (d and e). A blunt-pointed pair of scissors, bent on the flat and with the concave side turned towards the operator, is then introduced closed at c, the nick on the left labium, and pushed up to e, down to the line of demarcation between the mucous membrane and the skin, and over towards the other side. Next, they are introduced at b, the mark made on the right labium, and moved in the opposite directions, until the lower part of the flap is loosened. The more one approaches the skin (b c) the more adherent the mucous membrane is, and there may be cicatricial adhesions which must be severed with small cuts with the scissors. The flap is cut loose along the lines c e, c b, and b d. Next,

¹Garrigues, "Colpoperineorrhaphy," Med. News, May 30, 1896.

the scissors are moved upward from *d* and *e* to *a* and from side to side, loosening the whole vaginal wall from the underlying connective tissue and the rectum in the shape of a dome. This is done very easily by taking hold of the lower portion of the flap. Finally, the upper part

FIG. 138.



Garrigue's Colpoperineorrhaphy. *A*, denudation; *a*, top of prolapse; *b*, *c*, side limits on the inside of labia majora; *d*, *e*, intersection of side lines of denudation and side furrow of the vagina; *B*, tongue-shaped surface shown in *A* having been closed, the perineal sutures are inserted—2, all buried; 3 and 4, partly free—all in a slanting direction; 1, running catgut suture; 2, 3, 4, silkworm-gut sutures.

of it is cut loose by carrying the scissors in a curved line with the convexity turned outward. The whole flap has a shape that suggests a policeman's hat. When it is cut loose, a few small arteries spurt and are clamped or tied. In loosening it the point of the scissors should be kept close to the vagina, so as to leave as much tissue as possible in front of the rectum. Next, the edges are united by a running catgut suture from above down under the whole denuded surface. The first turns are horizontal, but the following are made to

dip a little towards the perineum, so as to lift the posterior wall of the vagina upward and forward towards the anterior. This suture is continued until the lines $f c$ and $f b$ (Fig. 138, *B*) have the same length as $g c$ and $g b$. Then a silkworm-gut suture (2) is carried from a point $\frac{1}{2}$ inch from the middle line (g) and $\frac{3}{8}$ inch from the denuded

FIG. 138 a.



Garrigues's Colpoperineorrhaphy. C, perineal sutures tied.

surface, about two-thirds of the distance from the end of the closed line f , and down to the corresponding point on the other side. A second silkworm-gut (3) is inserted midway between the first and the point c , carried under the denuded surface, out at h , on the line of demarcation between the denuded and undenuded tissue and between the inner and middle third of $f c$, inserted on the corresponding point i on the other side, carried under the raw surface and out at the corresponding point of the skin. A third silkworm-gut suture (4) is inserted near the outer end of the wound (c), brought out at k , midway between c and h , reinserted at j , the corresponding point on the other side, and brought out on the skin near b .

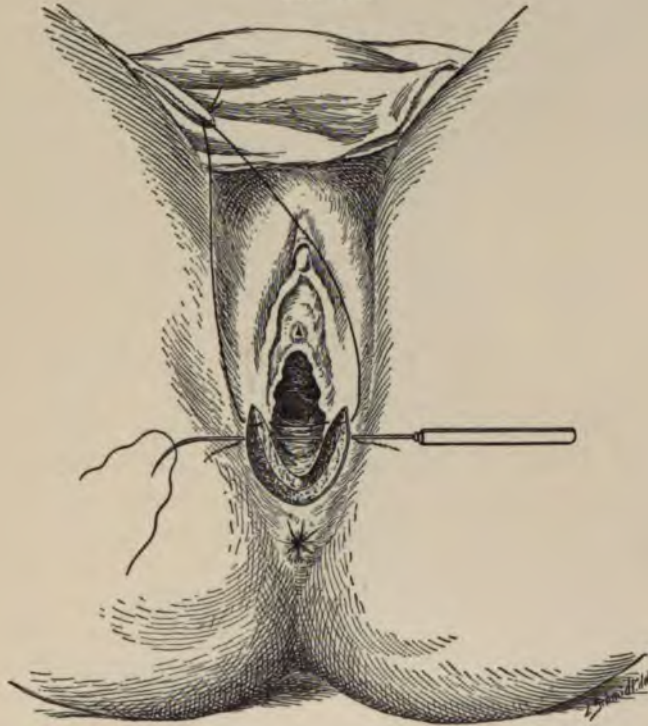
In order to protect the rectum, the left index-finger must be kept in it and guide the needle. As often as

it is taken out and used for other purposes, it is rinsed in a 1:2000 solution of corrosive sublimate. When one suture is passed, its ends are seized with a clamp and allowed to fall down, and the same is done with the following ones. When all three are in place, the surface is irrigated and the sutures are closed from behind forward, when it will be found that the vagina forms a C and that an artificial perineal body has taken the place of the old one. If needed, a couple of fine silk sutures are passed through the edges of the skin between the deep ones. After some time the vulva looks so normal that one hardly can see that an operation has been performed. The narrowed vagina dilates during subsequent pregnancies, and the perineum

either remains intact or sustains one of those moderate tears so common even in the normal perineum of primiparæ, and which is readily united by a few stitches. I remove the middle perineal suture on the fifth day, as there is danger of a fistula forming in this place, the other two on the eighth day.

(b) *Tait's Flap-splitting Operation* (Fig. 139).—The patient is placed in dorsal position, with raised knees. The index- and middle finger of

FIG. 139.

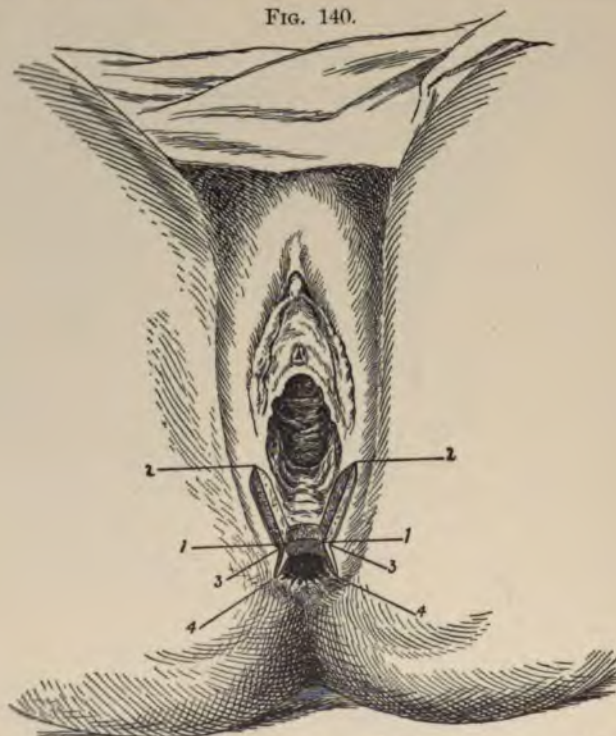


Tait's flap-splitting operation for incomplete laceration of the perineum.

the left hand are introduced into the rectum. One blade of sharp-pointed, knee-bent scissors is thrust in midway between the vulva and the anus to a depth of about $\frac{3}{8}$ inch, and carried in a curved line with the convexity outward to a point on the free edge of the labium majus, at such a distance from the glans of the clitoris as to leave room for copulation. Next, the scissors are turned the other way and a similar incision made on the opposite side. The two flaps are separated, spurting arteries clamped or tied, and then the surfaces are united

from side. For this purpose a handled needle, slightly curved near the end, is inserted $\frac{1}{2}$ inch outside of the wound and about $\frac{1}{2}$ inch from its anterior end, carried under the denuded surface on one side, pushed out at the edge of the vaginal flap, reinserted on the corresponding point on the other side, pushed under the right-side wound and brought out at the corresponding point of the skin. A strand of silkworm gut is passed through the eye of the needle and this withdrawn. The ends are seized

FIG. 140.



Tait's flap-splitting operation for complete laceration of the perineum. 1 to 1, first transverse incision; 1 to 2, incisions forming vaginal flap; 3 to 4, incisions forming rectal flap.

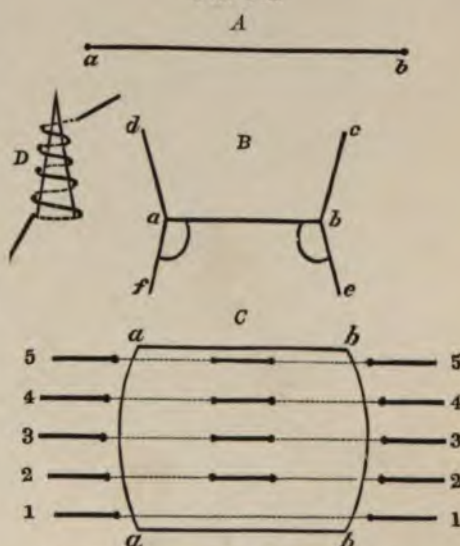
with an artery-forceps and thrown up on the abdomen. Another suture is passed in the same way, $\frac{1}{2}$ inch farther back. One ought to go through the tip of the tongue formed by the vaginal flap. One, two, or three more are passed under the whole cut surface behind the vaginal flap. In closing the sutures, care is taken to spread the surfaces well out and apply them flat against each other. If there is much redundant tissue to dispose of, the vaginal flap is turned forward and united separately, or it may even be necessary to cut a V-shaped piece out

of it. Between each two of the deep sutures a fine superficial silk suture may be passed through the skin alone.

2. COMPLETE LACERATION.—(a) *Tait's Flap-splitting Operation* (Fig. 140).—The cicatrix in the rectovaginal septum being put on the stretch by separating the buttocks, the scissors are run from one end of it to the other, making an incision about $\frac{3}{8}$ inch deep and producing a vaginal and a rectal flap (Fig. 141, A). From each end of this first incision another is carried at an obtuse angle, forward and outward into each labium for about 1 inch (Fig. 141, B, *b c* and *a d*). From the same point another incision, $\frac{1}{3}$ inch long, is carried backward and outward (Fig. 141, B, *a f* and *b e*), just outside of the ends of the torn sphincter, which can always be seen as a small glazed pit on each side. The flaps are now separated and the angles *c b a* and *d a b* are pulled upward and inward; the two others, *f a b* and *e b a*, downward and inward. Thus the lines *d f* and *c e* become curved, with the convexity turned outward (Fig. 141, C, *a a* and *b b*). The needle is carried as above described, with this difference, that it is made to emerge about $\frac{1}{4}$ inch from the bottom of the wound and enter at the corresponding point on the opposite side, except the hindmost, which closes the sphincter and is buried altogether. The sutures are inserted from behind forward, and one shall go through the angle of the wound between the two flaps. Finally, the raw edge of *a b* of the vaginal flaps is closed with a running suture of fine catgut (*D*).

If there is much tension, lateral incisions should be made parallel

FIG. 141.



Diagrams illustrating the incisions and sutures in Tait's operation for complete laceration of the perineum. A, first incision through the cicatrix between the rectum and the vagina, the buttocks being stretched apart (natural size). B, incisions to the edge of the labium majus and outside of the anus (without tension). C, flaps thrown up and down and stretched; sutures inserted in the order marked; the first goes through the ends of the broken sphincter; the third corresponds to the angle between the rectal and vaginal flap. D, continuous catgut suture through the edge of the upper flap of the original incision (*a b*) now turned into the vagina.

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the ascending ramus of the ischium on both sides. The sutures left in for three or four weeks, the bowels being kept loose all the time.

The ends of the sutures should be kept $\frac{1}{2}$ inch long, as they are deeply embedded and hard to find.

1) *Hirst's Operation*.—An angular denudation is made around the rectovaginal septum (Fig. 142). The rectum is closed, as a rule, with four silkworm-gut sutures. Another suture (*a*) of the same

FIG. 142.



Hirst's suture for complete laceration of the perineum.

al is carried around the tear. Next, the vaginal wound is united with four sutures and the perineum with three. If the denudation is extensive, it may be an advantage, after having placed and tied the rectal sutures from above downward, to whip the whole exposed surface together with a two-tier running catgut suture, beginning at the upper angle of the vaginal denudation, running down the side part of the wound, just short of the rectal mucous membrane, turning in the vagina to a point opposite the original insertion, and the two ends are joined by a single knot. If this supplementary catgut suture is not used, it is convenient to tie the rectal

sutures and to shot the intermediate suture. The vaginal and perineal sutures are inserted after the others have been closed, and it is best to shot them.

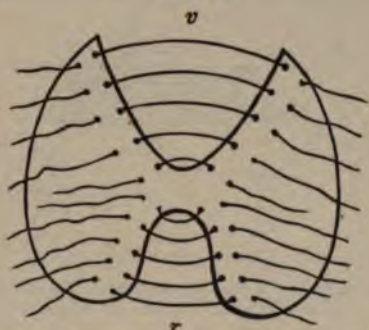
(c) *Lauenstein's Operation*.—Sutures entering the rectum may become infected and give rise to a small rectovaginal fistula. This is obviated by using submucous buried catgut sutures (Fig. 143.) A denudation somewhat like a butterfly is made on the posterior wall of the vagina and the inside of the labia majora. Catgut threads are introduced $\frac{1}{4}$ inch from the edge to be united, emerge near the mucous membrane of the rectum, are inserted on the corresponding point on the other side of the cleft, and brought out on the denuded surface $\frac{1}{4}$ inch from the edge. Vaginal sutures are placed in the same way, and finally the perineum is closed with silver wire or silkworm gut.

In closing the sphincter great care must be used to unite all the fibres of the broken ring. The inner ones are shorter than the outer ones (Fig. 144). The former are reached by inserting the needle $\frac{1}{4}$ inch behind and *inside* of the broken muscle (*D*) and carrying it under the denuded surface to the end of the inner fibres, and then through the corresponding points on the other side and out at *C*. Another suture is introduced outside of the longest fibres (*B*) and brought over to the other side (*A*). When these two sutures are tightened, the ends of the muscle are united in their full extent (Fig. 145).

If the rent in the septum is more than an inch long, it is best first to unite it from the vagina down to the sphincter, and after it has healed and the sutures have been removed after nine days, one of the above operations may be performed.

Preparation and After-Treatment.—Before the operation the bowels should be emptied by aperient medicine and enemas of Thiersch's solution and disinfected with internal medicines, such as naphthalin, salol, or carbolate of bismuth. The genitals are shaved. During the operation the field may be irrigated with hot antiseptic fluid. After the operation the wounds should be dusted with aristol. No dressing

FIG. 143.



Submucous catgut sutures. (Lauenstein.)
r, rectum; v, vagina.

is applied. The knees should be tied together for two weeks, but not so tightly as to inconvenience the patient. A piece of muslin from 6 to 8 inches wide is carried around one knee and fastened with two safety-pins. Then from 6 to 8 inches are left free, and finally the other knee is encircled in the same way, so that a perpendicular section through the bandage will be like Fig. 146. The food should be exclusively albuminoid (milk, beef-tea, raw oysters, and eggs), so as to leave as little fecal matter as possible. As a rule, some pain calls for small doses of morphine, but otherwise opiates should be avoided, as they constipate. The patient may lie on her back or her sides, but should move slowly and be assisted by the nurse. On the morning

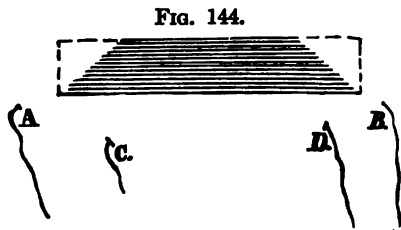


Diagram showing the retraction of the fibres in the broken sphincter ani. (T. A. Emmet.)

of the fourth day castor-oil (fl. ziii —12 grammes) is given, and when the patient feels that she is going to have an evacuation, four ounces (120 grammes) of warm olive-oil should be injected into the rectum. Thereafter she should every morning have enough castor-oil (about fl. zii —8 grammes) to insure an easy movement once or twice. If she has an insurmountable aversion for this drug, Hunyadi János water (about ziv —120 grammes) may be substituted. When the bowels have been moved, the patient may have mixed diet. When, after a few days, there appears some discharge from the vagina, this should be douched twice a day with antiseptic fluid, and in cases of complete laceration, half a pint of lukewarm normal salt solution should be injected at

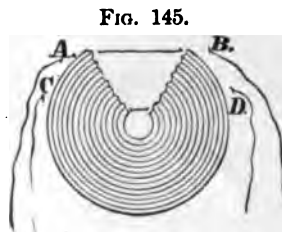


Diagram of broken sphincter ani with the ends brought together by sutures. (T. A. Emmet.)

the same time into the rectum. If the discharge is bloody, liq. ferri chloridi, zss (2 cubic centimetres) to a pint (500 cubic centimetres) should be used for the vaginal injection three times a day. If the patient is troubled with winds, much relief is afforded by the cautious introduction of a well-lubricated, smooth, soft-rubber tube into the rectum. As a rule, perineal sutures must be removed at the end of a week; vaginal ones may be left for weeks, and their removal is facilitated by inserting a vaginal Sims speculum along the anterior wall. Those in the rectum may be exposed in a similar way

of the fourth day castor-oil (fl. ziii —12 grammes) is given, and when the patient feels that she is going to have an evacuation, four ounces (120 grammes) of warm olive-oil should be injected into the rectum. Thereafter she should every morning have enough castor-oil (about fl. zii —8 grammes) to insure an easy movement once or twice. If

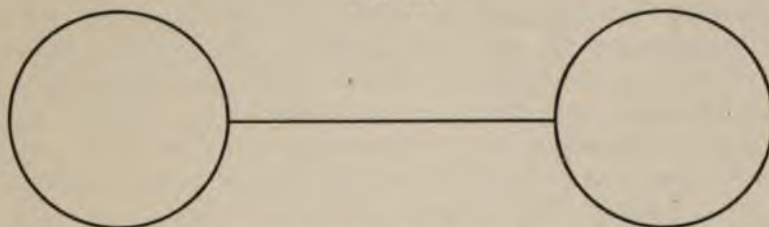
the discharge is bloody, liq. ferri chloridi, zss (2 cubic centimetres) to a pint (500 cubic centimetres) should be used for the vaginal injection three times a day. If the patient is troubled with winds, much relief is afforded by the cautious introduction of a well-lubricated, smooth, soft-rubber tube into the rectum. As a rule, perineal sutures must be removed at the end of a week; vaginal ones may be left for weeks, and their

with the patient in knee-chest position. If chromicized catgut is used in the vagina, it takes care of itself.

The patient should remain in bed for two or three weeks. Copulation ought not to take place for two months.

§ 2. *Garrulity of the Vulva, or Flatus Vaginalis.*—This is a rare condition in which air enters the vagina and is expelled with a noise. This can take place only if the vagina is enlarged and flaccid or the perineum membranous.

FIG. 146.



Transverse section through knee-bandage.

Treatment.—The vagina is diminished by an operation similar to that for incomplete laceration of the perineum; or cicatrices are excised and the wound united by suture.

§ 3. *Coccygodynia.*—Coccygodynia is a disease characterized by severe pain in the coccyx, whence it may radiate into the perineum, the hips, the uterus, and the bladder. It is hardly ever found in men and is exceedingly rare in childhood. It is generally due to childbirth, but may also be produced by external violence, such as a fall, a kick, horseback-riding, or by rheumatism. In some cases it seems to be a reflex neurosis from a urethral caruncle or from uterine, ovarian, or rectal disease. In others is found a fracture, an ankylosis, a dislocation, or too great length of the coccyx.

The cause of the comparative immunity in men is doubtless that the injuries due to childbirth are excluded, and that the greater curvature of the sacrum brings the coccyx more forward to a less exposed place. In children the rarity of the disease is probably due to the abundance of cartilaginous tissue in the sacrum and coccyx, which makes them more flexible.

Symptoms.—The pain is worst in sitting or getting up and by direct movement of the bone.

Diagnosis.—The diagnosis is readily made by placing the patient in the left-side position and seizing the bone between the index in the

rectum and the thumb on the skin over the bone, when the slightest movement elicits the pain. Sometimes also a diseased condition of the bone may be felt.

Treatment.—Tonics and antirheumatics should be prescribed. Suppositories with 5 grains (30 centigrammes) of iodoform or $\frac{1}{2}$ grain (2 centigrammes) of morphine, hypodermic injection of cocaine or morphine, rubbing with unguentum veratrinæ or oleatum aconitinæ (2 per cent.), blisters, cauterization with Paquelin's thermocautery, galvanism and high-tension faradization and treatment of disease in neighboring organs may effect a cure; but sometimes nothing will help but the removal of the bone—*coccygectomy*. The patient is placed on her right side or the abdomen. The operator stands behind her. An incision is made over the bone in the median line. The soft tissues are pushed aside bluntly and with a few touches of the knife. All the lateral connections and the articulations with the sacrum are severed, the bone is seized with Fergusson's bulldog forceps and pulled back, while some blunt, flat instrument is used for separating its anterior side, and the tendon of the levator ani muscle is cut with the knife. There is not much hemorrhage. In exceptional cases it may be necessary to separate the coccyx from the sacrum with Gigli's wire saw. The wound is closed with silkworm-gut sutures, which include the whole edge, but leave the levator ani muscle intact. After the operation the patient is pulled down over the end of the table. The wound is dusted with iodoform, covered with iodoform gauze and cotton, and a double spica is applied, inserting a piece of gutta-percha tissue so as to leave the anus and vulva free and keep the dressing clean. The sutures are removed after a week.

§ 4. **Hygroma.**—A cyst may develop in the coccygeal gland and acquire such proportions that it is inconvenient, or it may become inflamed.

Treatment.—Resolution may be attempted by painting with iodine. The contents may be evacuated with a trocar and tincture of iodine injected in order to produce adhesive inflammation. Part of the wall may be cut out and the remainder packed with iodoform gauze, which is changed daily. Or the whole tumor may be extirpated. If the cyst suppurates, it should be laid open in its full length, washed out with antiseptic fluid, and packed with iodoform gauze.

CHAPTER III

DISEASES OF THE VAGINA

§ 1. **Malformations.**¹—A. HYMEN.—1. It is doubtful if the hymen is ever *absent*, but it may be reduced to a low ridge.

2. *Atresia hymenalis*, or *imperforate hymen*, is the condition in which there is no opening in the hymen. Mucus and blood are retained and gradually form a tumor bulging in the perineum and later invading the vagina, the cervix, and the body of the uterus. The walls become hypertrophied. The disease makes itself most felt after puberty, each menstrual period being accompanied by an increase in the size of the tumor, severe pain, and sometimes convulsions. If the contents are bloody, the condition is called *hæmatocolpos* in the vagina, *hæmatometra* in the uterus. If suppuration sets in, it is called respectively *pyocolpos* or *pyometra*. As a rule, the blood constitutes a thick, dark, tarry mass.

The tubes may also be distended by blood, but need not communicate with the uterine cavity, since the blood is secreted by the mucous membrane of the tubes themselves. Here the tumor is called *hæmatosalpinx*. The hymen has even been found imperforate in pregnant women, which is explained by the presence of a minute opening admitting spermatozooids and closing up later.

Diagnosis.—A similar tumor may be produced by a septum situated above the hymen; but this never gives rise to the bulging in the perineum, and by exact examination the hymen is found below the septum.

Prognosis.—Atresia is a serious condition, which may end in rupture and death. Even the operation for it is not without danger.

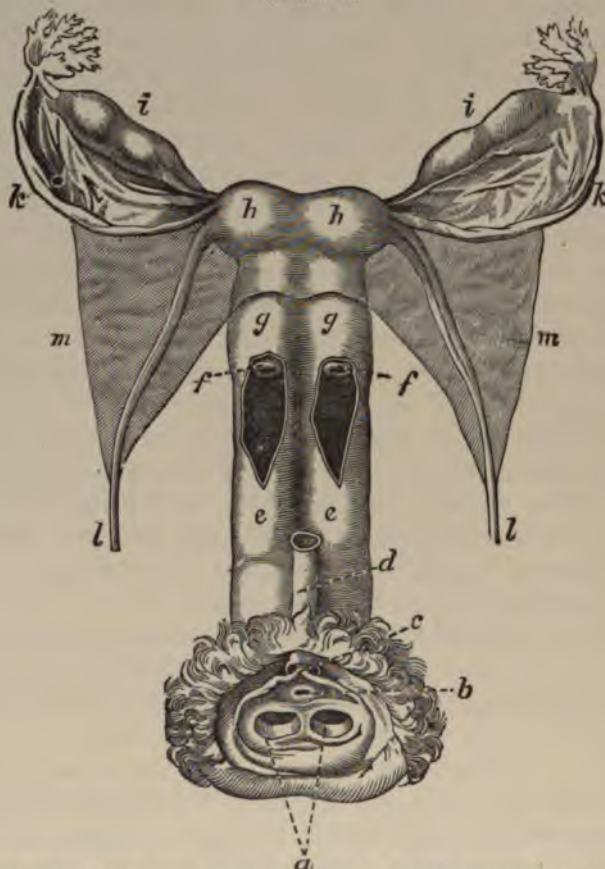
Treatment.—The hymen should be opened widely by a crucial incision or cut off altogether. In the latter case the edges should be united by a running catgut suture. *No pressure should be exercised*, but the vagina and uterus washed out with a warm solution of bicarbonate of sodium (5ss to Oii—15 grammes to 1000 cubic centimetres), followed by an antiseptic injection. As long as there is any discharge, the patient must be kept in bed and have an antiseptic vaginal injec-

¹ Garrigues, "Malformation of the Female Genitals," Mann, System of Gynecol., 1887, Philadelphia, Lea.

tion three times a day. If hæmatosalpinx can be made out beforehand, it is better first to perform laparotomy and remove the tubes, leaving the ovaries, if they are healthy.

3. *Abnormal Openings*.—There may be one minute opening, which hardly can be found. If the vulva is deep and the hymen elastic,

FIG. 147.



Double hymen, vagina, and uterus. (Eisenmann.) *a*, double entrance to vagina, with double hymen; *b*, meatus urinarius; *c*, clitoris; *d*, urethra; *ee*, double vagina; *ff*, double vaginal portion, with double os uteri; *gg*, double cervix; *hh*, bodies and horns of uterus; *ii*, ovaries; *kk*, Fallopian tubes; *ll*, the round ligaments; *m*, the broad ligaments.

this condition sometimes escapes attention by the patient or her husband and is found accidentally, when for some purpose a vaginal examination is made by the physician. There may also be many small openings (*hymen cribriformis*). Or there may be two lateral

apertures. If the partition between them is wide, the malformation is called *hymen biforus*. If it is narrow, the condition is termed *hymen septus*. If a prolongation extends into the lumen of the vagina without reaching the opposite wall, it is denominated *hymen subseptus*.

Treatment.—If these abnormal forms of hymen cause any inconvenience, it is easily remedied by removing the septum or cutting away the hymen.

4. *Double Hymen*.—There may be one hymen above the other, due to a transverse septum in the lower part of the vagina, or the two may be placed side by side, the vagina also being double (Fig. 147).

Treatment.—If the abnormal shape gives any trouble, the septum or both hymens are removed.

5. *Fleshy Hymen*.—Sometimes the hymen is unusually thick and does not rupture during copulation. The attempts at coition are unsatisfactory and painful, and may give rise to vaginismus.

This trouble is readily cured by excising the hymen and uniting the edges of the wound with a running catgut suture.

B. VAGINA.—1. *Atresia and Stenosis*.—By *atresia* is understood the condition where the vagina is totally closed by a transverse septum or does not exist at all. *Stenosis* means narrowness. Some use the word *atresia* to designate higher degrees of stenosis, and distinguish then between *complete atresia*, where there is no opening, and *incomplete*, when it is small. The lower end of the vagina may be closed by a thin membrane (*septum retrohymenale*), or one or more solid transverse septa may be found higher up.

If the vagina is absent, the uterus may be absent too, or rudimentary,¹ but in other cases a well-formed womb may be found above the tissue where the vagina should have been developed.

Complete atresia of the vagina (Fig. 148) gives rise to retention of the menstrual flow and other conditions mentioned under *atresia* of the hymen. If the septum is situated far down, first the vagina is distended and gradually the uterus is drawn into the process (Figs. 149, 150). *Atresia* prevents impregnation and, if situated far down, causes *dyspareunia*,—that is, makes copulation impossible or unsatisfactory. In some women the urethra is so easily distensible that copulation takes place through this canal.

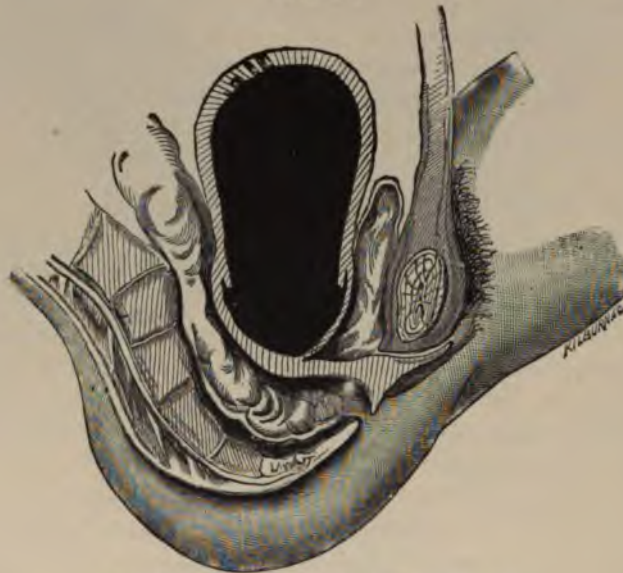
Incomplete Atresia.—Much more frequently the *atresia* is incomplete, when menstrual flow can escape and semen enter.

¹ Garrigues, "Atresia Vaginæ, Solid Uterus, Hæmatoma of Left Ovary," Med. News, Feb. 10, 1900.

Transverse septa are most likely due to a faulty fetal development. The vagina is formed by the lower portions of the Müllerian ducts, which coalesce in the fetus. A transverse septum would result if these tubes, which originally are solid columns of cells, failed to be tunnelled throughout.

A *general narrowness* of the vagina may be due to arrest of development. Perhaps one Müllerian duct has not been tunnelled in this portion of its course. Then the vagina would only be built up by the development of one-half of the substratum that belongs to it.

FIG. 148.



Complete atresia of the vagina.—Hæmatometra.

The vagina may also become narrowed by cicatricial retraction after ulceration or cauterization.

Treatment.—All that has been said about the treatment of atresia hymenalis finds application in that of vaginal atresia, but besides this latter offers special indications.

If there is an incomplete atresia between an upper and lower well-developed portion of the vagina, the narrow part may be incised longitudinally in several places, the narrow portion dilated, and the edges of the wounds united transversely, whereby a shorter, but wider, canal is produced.

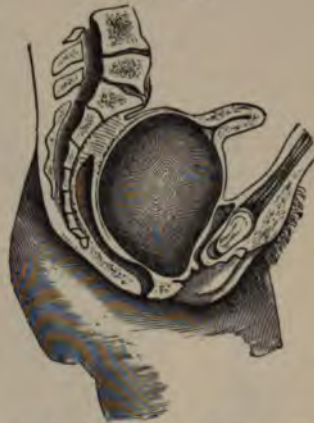
In case of *absence* of the vagina, the first thing to do is to ascertain

whether there is a uterus and ovaries or not. If the patient has a uterine cavity into which every month is poured blood, an operation is imperative to save her life. If the uterus is rudimentary, but the ovaries give rise to painful molimen, they should be extirpated by laparotomy. If there are no internal generative organs, the malformation may perhaps be improved with a view to copulation. If there are normal inner organs, even impregnation may take place after the formation of a vagina, but child-birth would be so dangerous that gestation should be interrupted by artificial abortion or abdominal hysterectomy.

Modus Operandi.—The patient is placed in the dorsal position, a transverse incision is made in the vulva. With forefinger and closed scissors the operator separates the bladder from the rectum, guiding himself by holding the left forefinger in the rectum and having an assistant hold a male sound in the bladder. When the os is reached, it is dilated and the cavity washed out as described under atresia hymenalis. During the healing process a hollow glass plug (Fig. 151) is kept in the new-formed vagina in order to prevent shrinking. Epithelial cells are produced in the vulva and gradually cover the denuded surface, a process which is furthered by painting the tissue once a day with a weak solution of nitrate of silver (gr. ii to ʒi—12 centigrammes to 30 grammes). Even after healing the tendency to closure persists, and the patient should during a whole year wear her plug for an hour every day. If she neglects this, the vagina contracts again. If possible, flaps should be made of the mucous membrane of the vulva and used to cover the wall of the vagina, or a piece removed from another patient in performing colpoperineorrhaphy may be sutured to the hollow made. The flap and transplantation methods may especially be used to advantage in cases where there is no uterus, in order to constitute an organ for copulation.

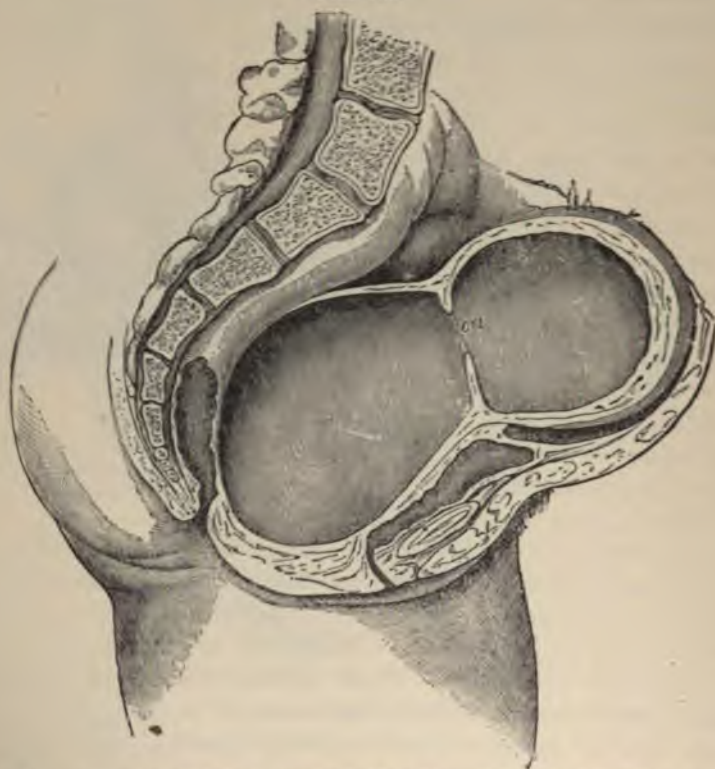
General narrowness of the vagina is treated with gradual dilatation by means of a bivalve speculum or oval hard-rubber dilators of increasing size, and inunction with a lubricant before coition.

FIG. 149.

Atresia of the entrance to the vagina.
Hæmatocolpos.

2. *Double Vagina* (Fig. 147 a, p. 166).—Normally the partition between the two Müllerian ducts is resorbed in that portion of their course which is destined to form the vagina and the uterus; but if this process is arrested, two tubes remain and develop into the two halves of a more or less completely divided vagina and uterus. If childbirth takes place, the septum in the double vagina is usually completely destroyed.

FIG. 150.



Atrophia of the entrance to the vagina. Hematocolpos and hæmatometra. v, vagina; ou., os uteri.

As we have seen above, each vagina may have a separate hymen, and at the other end there may be a single or double vaginal portion.

Treatment.—Often the septum does not give rise to any symptom, and is then left alone, if at all discovered. But if it interferes with coition or impregnation, the two vaginæ are held open with retractors and the partition severed in its full length with a thermo- or galvano-

If the septum is reduced to a mere band at the entrance, it is best to tie it at both ends and cut it out.

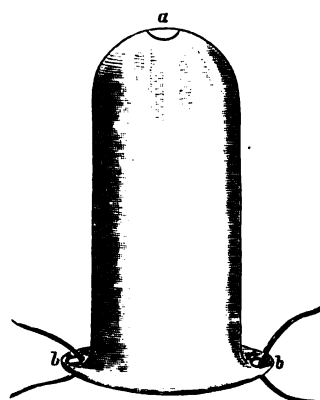
Double Vagina combined with Atresia.—The double vagina may on one or both sides be closed by a transverse septum. If one side is open, menstruation and impregnation may take place in that half; but at the same time there is menstrual molimen and formation of a tumor, which bulges into the open half and extends on the side of the uterus (Fig. 152). If rupture takes place, it occurs always in the septum of the cervix. After a time the opening closes again and new accumulation arises. Microbes enter, the blood is decomposed and becomes purulent and putrid (*lateral pyocolpos* and *lateral pyometra*). The wall ulcerates and the inflammation may extend to the tube and the peritoneal cavity.

Diagnosis.—Double atresia gives rise to symptoms like those of atresia in a single vagina. Unilateral atresia bulges into the open half. If the tumor is not very tense, it may be possible to invaginate it and feel the os uteri above. If rupture has taken place, pressure on the tumor makes pus appear in the os of the open side. *Hæmatocele* is an acute disease, and there is no history of monthly exacerbations. A *myoma* of the uterus is harder and nodular, without regular molimen. A *cyst* connected with the uterus has no exacerbations.

Treatment.—The open half is distended with a retractor and the septum cut with a thermo- or galvanocautery. If the atresia is double-sided, one side is first opened as described for atresia of the hymen, and thereafter the partition is attacked.

3. *Faulty Communications.*—We have seen above that the rectum may end in the fossa navicularis (Fig. 120, p. 114). It may open also into the vagina (*atresia ani vaginalis*), or, on the other hand, the urethra and vagina may seem to debouch into the rectum; but this is really due to a *persistent cloaca* which is found in early fetal life (Fig. 119, p. 113). In other cases the urethra seems to have its outlet in the vagina, which is due to a *persistent urogenital sinus* (Fig. 121, p. 115). Very rarely there is a normal anus and besides a communication between the rectum and vagina—a *congenital rectovaginal fistula*.

FIG. 151.

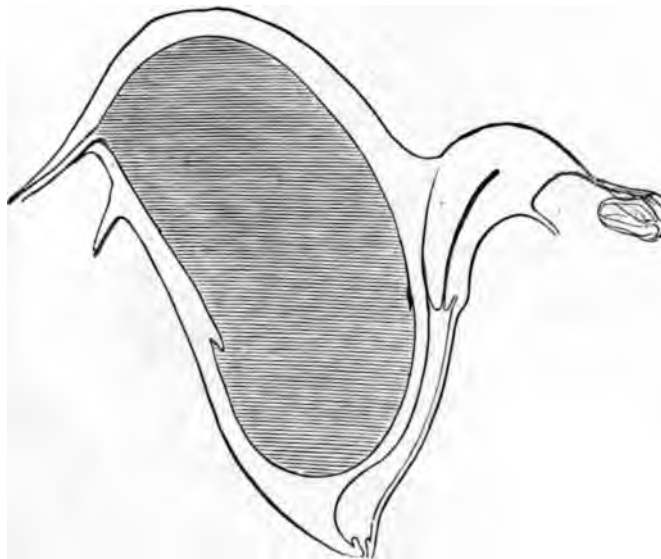


Garrigues's glass plug for vagina. *a*, vent for blood or secretion; *b b*, openings for passing strings.

Treatment.—In regard to the vaginal anus, what has been said above about the vulvar anus applies also to it. The congenital fistula may be closed like an acquired one. The other conditions have only anatomical interest.

§ 2. **Vaginal Enterocoele.**—The intestine, sometimes accompanied by the omentum or ovary, may in rare cases form a hernia in the vagina. Sometimes the whole vaginal wall bulges into the lumen of the canal. In other cases there is an opening in the muscular wall

FIG. 152.



Unilateral hæmatocolpos and hæmatometra. (A. Martin.)

of the vagina through which the intestine escapes under the mucous membrane. The protrusion begins in Douglas's pouch, *posterior vaginal enterocoele*, or more rarely in the vesico-uterine pouch, *anterior vaginal enterocoele*. In the latter place it may enter the labium majus, and constitutes then a *posterior labial hernia*. It forms a soft, elastic, pear-shaped tumor in the vagina or protrudes through the vulva. It may be reducible like another hernia. It gives rise to pain, dyspareunia, and may be seriously contunded during childbirth.

Treatment.—Sometimes the intestine may be kept back by a bulky pessary. If not, it may be cut down upon, part of the covering sac excised, and the edges united by suture. Laparotomy may be per-

formed, and the sac inverted and fastened in the lower end of the abdominal wound.

§ 3. Prolapse of the Anterior Wall of the Vagina; Cystocele.

—More than any other part of the vagina, the anterior wall is liable to become prolapsed, and, on account of the tight connective tissue between it and the bladder, the latter organ nearly always participates in the displacement.

Etiology.—The chief causes are pregnancy and childbirth, during which the pelvic ligaments and connective tissue become infiltrated with serum and overstretched. If the perineum and the levator ani muscle with its two fasciæ are torn, there is a deficient support for the anterior wall from below. The weight of the urine in the bladder contributes also to crowd the anterior wall downward.

Symptoms.—Cystocele forms a soft bulging-out of the anterior wall of the vagina, which becomes visible through the entrance to the vagina when the woman lies on her back, with separated knees. It gives rise to frequent micturition and often incomplete evacuation of the bladder, with consequent cystitis.

Treatment.—If the prolapse is small and combined with a similar condition on the posterior wall, it may suffice to repair this latter and the perineum without directly attacking the anterior wall. But generally this is necessary.

(a) *Sims's Operation.*—The patient is in dorsal position. The posterior wall is kept out of the way with Garrigues's weight speculum. The cervix is drawn down with a bullet-forceps. With a pair of tenacula the sides of the prominence are drawn together in the median line in order to see how much of the wall is redundant, and these points

FIG. 153.



Pawlik's vaginal trigone, corresponding to Lieutaud's vesical trigone. *l.m.*, labium minus; *m.u.*, meatus urinarius; *u.l.*, urethral ledge; *l.f.*, lateral fold; *b.f.*, basal fold; *v.p.*, vaginal portion of uterus drawn down.

are marked with small nicks. Next, the whole surface is put on the stretch between four pairs of bullet-forceps,—one at each of the sidemarks, one near the cervix, and one at the transverse ridge at the inner end of the urethra (Fig. 153).

FIG. 154.



Diagram of denudation in Sims's cystocele operation. The figures designate the parallel strips of mucous membrane to be cut off.

With a pair of scissors curved on the flat, a strip about $\frac{1}{4}$ inch wide is cut out of the mucous membrane. Similar strips are removed on both sides until an oval is denuded (Fig. 154). Finally, a running suture of chromicized catgut is passed under the whole pared surface, uniting the edges from side to side.

(b) *Rieck's Method* (Fig. 155).—A median incision is made from the cervix to the urethra, but only one flap loosened. The other side is denuded superficially. The

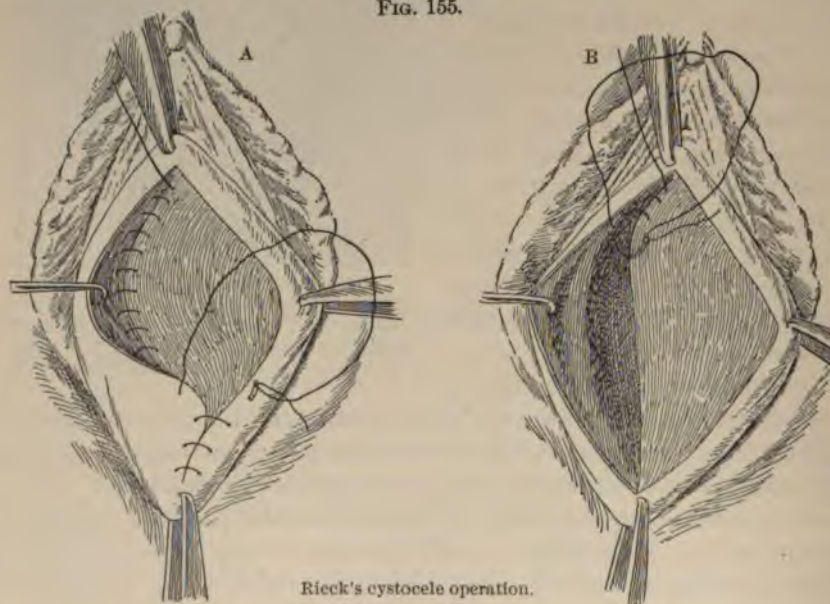


FIG. 155.

Rieck's cystocele operation.

Continuing the suture, the edge of the loose flap is fastened to the outer

boundary of the denuded surface (Fig. 155, B). Thus the bottom of the bladder is doubled and fortified by cicatricial tissue, and the sutures are placed laterally where there is the least tension.

§ 4. Prolapse of the Posterior Wall of the Vagina; Rectocele.

—Next to the anterior wall of the vagina, the posterior is most apt to prolapse. This is generally called *rectocele*, but often without cause, for the connective tissue between the rectum and the vagina being loose and lax, the vaginal wall slides away from the intestine instead of dragging it along. It is only in the length of time that the anterior wall of the intestine, lacking the usual support, bulges out and follows the prolapsed vaginal wall; or the posterior vaginal wall may be bound to the rectum by cicatrices and draw it along. The prolapse constitutes a protrusion on the posterior wall similar to that produced on the anterior by cystocele, and visible in the entrance to the vagina when the woman lies on her back and separates her knees. It gives rise to a dragging sensation and constipation.

Etiology.—The causes producing posterior prolapse are the same as those of cystocele, except the weight of the urine, instead of which here constipation acts both as cause and effect.

Treatment.—Posterior prolapse may be treated in a way similar to that of the anterior, but since generally it is combined with laceration of the perineum, *colpoperineorrhaphy* is indicated.

§ 5. General Prolapse and Inversion of the Vagina (Fig.

156).—The whole vagina may become inverted, prolapsed, and hang as a sausage-shaped tumor between the thighs. Only the fossa navicularis resists in most cases and secretes a whitish smegma of unpleasant odor. At the lower end of the tumor is the dilated os. The epithelium becomes hard and dry, like epidermis; and often flat ulcers with a bluish area

FIG. 156.



Inversion of the vagina with supravaginal hypertrophy. (Huguier.) Ulcer on anterior wall.

develop, especially around the os, in consequence of lack of cleanliness and friction against the clothes. The front of the tumor is formed by the bladder, which may be emptied by inserting a catheter downward. Behind the bladder is felt the elongated cervix of the uterus. This will be considered under HYPERTROPHY OF THE SUPRAVAGINAL PORTION OF THE UTERUS.

§ 6. **Injuries; Thrombus, or Hæmatoma.**—One or more tears are normally produced in the *hymen* by the *first* complete coition. This injury is accompanied by pain and slight bleeding, but exceptionally the latter may acquire the proportions of a dangerous and even fatal hemorrhage. The prophylaxis consists in the inunction of the male organ with white vaseline. The curative treatment may require ligation of a spurting artery. Ordinarily the application of liq. ferri chloridi suffices. The tear should be given time to heal before it is exposed to new dilatation.

Injuries to the *vagina proper* are of much greater importance. They may be due to coition, childbirth,¹ a fall, attacks of horned animals, or the extraction of a large fibroid from the uterus. They are accompanied by pain and hemorrhage. Sometimes the intestine prolapses and may become gangrenous, leaving an ileovaginal fistula. Septicæmia may supervene. There may also remain a recto- or vesicovaginal fistula.

Prognosis.—With proper care, the prognosis is good.

Treatment.—The vagina should be cleansed, prolapsed intestine replaced, the tear sutured, and the vagina packed loosely with iodoform gauze.

HÆMATOMA, or THROMBUS, is an extravasation of blood into the connective tissue surrounding the vagina. It is nearly always due to childbirth.²

§ 7. **Foreign Bodies.**—Forgotten pessaries or sponges, hair-pins, and other hard, sometimes very voluminous, objects may remain for months or years in the vagina. Intestinal worms or insects may invade it.

Symptoms.—Foreign bodies may cause pain, bleeding, inflammation, ulceration, or gangrene. They may interfere with copulation, micturition, or defecation, and produce fistulous communications with neighboring organs.

Diagnosis.—In most cases the diagnosis is easily made by digital examination or speculum, but sometimes it may be quite difficult.

¹ Garrigues, "Obstetrics," 1902, p. 535.

² Ibid., p. 521.

The object may have burrowed and the tissues closed over it. The diagnosis is often facilitated by examining through the rectum and introducing a catheter into the bladder. A bloody, offensive sponge has been taken for *cancer* of the cervix.

Treatment.—The indications are to remove the body and remedy the disorders it has produced. As a rule, removal is accomplished through the vulva, but in rare cases the rectum or the bladder are preferable. Large objects may have to be crushed with a lithotrite or cut with shears. Incisions may have to be made to reach the object. Hair-pins almost invariably point downward towards the vulva with their pointed ends, which have to be liberated. Broken glass may be removed by lubricating the walls and filling the vagina with plaster of Paris, which, after settling, may be withdrawn without cutting the walls. Sometimes a purchase can be obtained by hooking a finger over the body from behind, through the rectum. Exceptionally, laparotomy must be performed.

§ 8. *Colpitis, Elytritis, or Vaginitis.*—Inflammation of the vagina may be *acute* (lasting less than a month) or *chronic*; *primary* or *secondary* (by extension from neighboring organs); *catarrhal* (characterized by a discharge); *exudative*, in which a solid substance is deposited on the surface of the mucous membrane (*croupous colpitis*) or in the depth of it (*diphtheritic colpitis*); or *phlegmonous*, called also *perivaginitis* or *dissecting vaginitis*, where the inflammation is developed in the connective tissue surrounding the vagina.

The catarrhal colpitis is subdivided into, 1, the *granular*; 2, the *simple*; 3, the *adhesive*; 4, the *gonorrhæal*; 5, the *exfoliative*, and 6, the *emphysematous*. To the diphtheritic belongs the *dysenteric*.

A. CATARRHAL COLPITIS.—1. In the *granular* form the surface is studded with round prominences, the size of lentils, produced by the swollen papillæ and groups of round cells under the epithelium.

2. A similar process takes place in the *simple* catarrhal form, but on a smaller scale, so that no protrusions over the level of the epithelium are developed (Fig. 157).

The lower portion of the normal vagina abounds in cocci and bacilli. The upper is free, the acid secretion killing the microbes or depriving them of their virulence; but under favorable circumstances they survive and cause inflammation. The vaginal secretion possesses, however, no such power over gonococci. In the catarrhal discharge is commonly observed an infusorium, called *trichomonas vaginalis* (Fig. 158).

3. In *adhesive* colpitis the epithelium is thrown off, leaving nude, round areas or streaks, which have a tendency to coalesce with similar surfaces on the opposite wall, forming adhesions. This form is most frequently found in old women or children.

Etiology.—Old women are liable to colpitis without any assignable cause. At the other end of the scale of age the disease is common

FIG. 157.



Chronic colpitis.

in little girls, the small dimensions leading to an accumulation of cast-off epithelial cells. Pregnancy and menstruation frequently lead to it. Anæmia and scrofula predispose to it. Direct causes are refrigeration, venereal excesses, masturbation, rape, foreign bodies, too hot or too strong injections, a urinary or fecal fistula, or acrid discharge from the uterus, or a pelvic abscess. The real morbid agent is the presence of microbes, especially the gonococcus.

FIG. 158.



Trichomonas vaginalis. (Haussmann.)

Symptoms.—The patients complain of heat and pain in the vulva and vagina, pain in the pelvis, general malaise, a burning sensation during micturition, and sometimes painful defecation. They have often fever. The vagina is so sensitive that coition is impossible. Upon examination we find the mucous membrane red and swollen, perhaps granular, or the seat of superficial ulcers. At first it is dry, but soon a mucous discharge appears that gradually becomes purulent. The vulvovaginal glands may be inflamed, which may end in resolution, induration, or abscess. The inflammation is increased by menstruation, pregnancy, and childbirth.

4. The gonorrhœal form is described under **VENEREAL DISEASES** (p. 142).

5. In *chronic catarrhal colpitis* the symptoms are less severe. The mucous membrane is more slate-colored. The chief symptom is the discharge, which may be mucous or purulent. The inflammation may have a chronic type from the beginning or start in the acute form. The gonorrhœal colpitis is particularly apt to become chronic, because the infection remains in the urethral ducts, the vestibular follicles, or Bartholin's glands.

Diagnosis.—A discharge secreted by the vagina should be distinguished from one flowing into it from the uterus or through a fistulous tract from a pelvic abscess. The most important diagnostic point in regard to colpitis is the distinction between the specific—that is, gonorrhœal—and non-specific inflammation. In the specific form the mucous membrane is more deeply red and the discharge thick, creamy pus. The urethra is nearly always implicated, and the vulvovaginal glands frequently. There are often venereal warts. If the presence of Neisser's gonococcus can be made out, that settles the diagnosis; but, as stated above, there are other diplococci much like it, and, on the other hand, connection with a man without gonococci, but with other cocci, may result in an inflammation extending all the way from the vulva to the peritoneal cavity. Only expert bacteriologists should take upon themselves the responsibility of giving in a court of justice testimony which may cast opprobrium on an innocent wife or condemn a man suspected of rape. Besides the bacteriological and clinical proof, evidence should be looked for in the history of the case. The presence of ophthalmia in a child or colpitis in another member of the family may throw some light on the nature of a given case; but common non-specific catarrh may also be infectious.

Prognosis.—The prognosis of common acute catarrhal colpitis is good. The chronic form may be very protracted.

Treatment.—Severe acute colpitis should be treated with rest in bed, a saline aperient, bland diet, hot alkaline affusions (borax or bicarbonate of soda, 1 per cent., with addition of tincture of opium, 8 per cent.), and sitz baths. If the vagina is not too tender to admit any instrument, injections with chamomile infusion or linseed decoction should be administered. When the affection enters on a less acute stage, astringent vaginal injections with borax, alum, sulphocarbonate of zinc, sulphate of copper, sulphate of zinc are prescribed. Still later the vagina is painted two or three times a week with tincture of iodine or a strong solution of nitrate of silver (8 per cent.). Instead of or combined with injections, tampons soaked in glycerin

with astringents may be employed—bismuth (1 : 4), tannin (1 : 8), or boroglyceride (1 : 16). These pledgets are changed twice daily.

In chronic colpitis similar astringent injections and applications are indicated.

6. *Exfoliative or epithelial colpitis* is a rare disease, usually combined with membranous dysmenorrhœa in hysterical women. Membranes, composed of epithelial cells, blood-corpuscles, and sometimes fibrin, are found lying loose in the vagina or easily detached from it without causing any bleeding. Local astringents have an unfavorable effect, while a general tonic and sedative treatment, especially large doses of bromide of potassium, is useful.

7. *Emphysematous colpitis* is likewise rare. It is characterized by the development in the upper part of the vagina and on the vaginal portion of the uterus of cysts filled with gas. They vary in size from a millet-seed to a hazel-nut and have a grayish, bluish, or pink color. When pricked open the gas escapes. It is produced by the *bacillus emphysematosus*. The disease is most common in pregnancy, and is only found in women suffering from profuse catarrhal discharge. It causes no discomfort and disappears spontaneously within three months after childbirth.

Treatment.—In pregnant women it needs no treatment. In others dilute hydrochloric acid (1 per cent.) is poured into the vagina through a speculum; or injections with carbolic acid, boric acid, or corrosive sublimate are administered.

8. *Mycotic Colpitis.*—Two kinds of fungi may grow in the vagina, —*leptothrix vaginalis* and *oidium albicans* (Fig. 159).

Leptothrix causes hardly any discomfort, while *oidium* may give rise to pruritus. They may be due to coition with a man suffering from diabetes mellitus or be carried by fingers of millers and bakers who handle much flour.

The *prognosis* is good. The disease may be cured in two weeks.

Treatment.—If the inflammation is acute, treatment should begin with sitz baths and emollient injections, as for gonorrhœa. Later the vagina should be douched several times a day with antizymotic solutions of sulphate of copper (1–2 per cent.), permanganate of potassium (1–2 per thousand), carbolic acid (2 per cent.), creolin (1 per cent.), or corrosive sublimate (1 : 2000).

B. *EXUDATIVE COLPITIS.*—A fibrinous exudation takes place on the surface or in the tissue of the mucous membrane. Around the yellow or gray diphtheritic patches the mucous membrane is dark red,

brown, or greenish.¹ This is a common form of puerperal infection. Mostly it is due to streptococci, but the true bacillus diphtheriæ has also been found. It may be produced likewise by too strong solutions of corrosive sublimate or by systemic diseases, such as smallpox, typhoid fever, or measles.

Prognosis.—If produced by local chemical irritants, the disease is of minor importance. When part of the manifestations of infectious diseases, it is a sign of serious systemic disturbance. In the puerperium it is due to a local infection that may become general and end fatally.

Treatment.—The irritation caused by chemicals should be treated with weak antiseptic applications and mild ointments, such as vaseline or zinc ointment. If the exudation appears as a symptom of system diseases, it is painted with tincture of iodine or Monsell's solution mixed with equal parts of glycerin. If it is the beginning of puerperal infection, the patches are cauterized with a 50 per cent. solution of chloride of zinc,² and if the bacillus diphtheriæ is found, the corresponding antitoxin should be injected hypodermically.

Dysenteric Colpitis.—In patients suffering from dysentery the diphtheritic process may extend from the rectum over the perineum, through the vulva to the vagina. There are grayish patches and superficial ulcers, surrounded by a dark red area. In and under the epithelium are found numerous micrococci.

The treatment of the vagina is the same as for puerperal diphtheria, combined with the local treatment of the rectum and general medicinal measures.

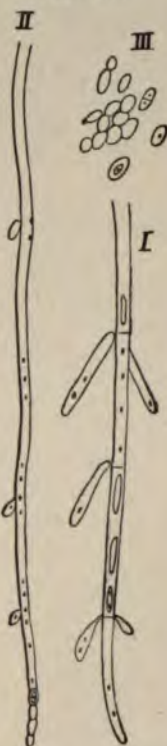
C. PHLEGMONOUS COLPITIS.—In this variety the inflammation attacks the connective tissue surrounding the vagina.

1. *Dissecting colpitis* is that form of phlegmonous colpitis in which the whole vaginal tube, inclusive of the vaginal portion of the uterus, is loosened by suppuration from the neighboring tissue and expelled.

¹ Garrigues, "Puerperal Diphtheria," Trans. Amer. Gynæcol. Soc., 1885, vol. x. p. 96.

² Garrigues, "Obstetrics," 1902, p. 729.

FIG. 159.



Oidium albicans.
(Haussmann.) I, II,
thread-shaped form;
III, yeast-shaped
form.

It is a rare occurrence, which has happened in typhoid fever, pneumonia, and other severe diseases. After the expulsion the wound heals by granulation, and considerable stenosis may be expected.

Treatment.—The vagina should be douched with antiseptic fluid. A tampon dipped in camphor emulsion (10 per cent.) should be kept in the vagina until all necrotic tissue is eliminated, which process should be furthered by severing resisting strings. The granulating surface should be powdered with iodoform or aristol or smeared with iodoform ointment. Contraction should be prevented by the use of tampons, dilators, and specula.

2. *Burrowing Abscess.*—Pus from a pelvic abscess may burrow in the connective tissue around the vagina and form fistulæ into this organ or the rectum, undermining the patient's strength.

Treatment.—As soon as an abscess is felt, it should be opened from the vagina, washed out with antiseptic fluid, and loosely packed with iodoform gauze. Fistulous tracts should be laid open or dilated with laminaria and curetted.

ÆDŒOCOLPITIS, OR VULVOVAGINITIS, IN CHILDREN.—On account of the delicacy of the epithelium and the narrowness of the parts, the mucous membrane of the vulva and the vagina frequently becomes inflamed in children. It may be a simple *catarrhal* or a *gonorrhœal* inflammation. The first may be due to lack of cleanliness, accumulation of epithelial cells, masturbation, hyperacid urine, enuresis, or pinworms. It may appear in the course of eruptive fevers. It may be due also to contagion. The second is produced by the presence of gonococci, which may be brought in by coition, especially rape; or by the use of infected towels, bath-tubs, etc.

Treatment.—The parts should be cleaned and the vagina injected three times a day through a soft-rubber catheter with a quart of a solution of permanganate of potassium (1:3000). Internally alkalines should be given. In this way the trouble is usually cured in two weeks.

§ 9. *Gangrene of the Vagina.*—The vagina may become gangrenous through pressure from a pessary or the child's head in parturition or by the action of caustics. It may, like gangrene of the vulva, accompany noma, in which case the infecting substance is doubtless brought directly from the cheek to the genitals. Diphtheritic colpitis may also lead to it. The whole mucous membrane, inclusive of that covering the vaginal portion of the uterus, and part of the subjacent tissue is changed into a black, offensive, necrotic

mass. Gangrene causes pain, dysuria, and sometimes hemorrhage, which may prove fatal.

The local treatment is the same as for dissecting colpitis (p. 182). The patient's strength should be kept up with stimulants, tonics, and nutritious food.

§ 10. **Vaginal Cicatrices.**—Cicatricial tissue is exceedingly common in the vagina of women who have borne children, and often gives rise to no symptoms. In some cases it causes pain, either at its seat or in neighboring or remote organs, dysuria, or painful defecation. It may lead to such contraction as to interfere with coition or menstruation, or even produce complete atresia. During pregnancy it softens considerably.

Cicatrices are generally due to tears in childbirth, more rarely to injudicious use of caustics or unsuccessful plastic operations.

Treatment.—Prevention is to be sought in careful midwifery, immediate closure of perineal lacerations, proper use of healing substances, and solid oval dilators of hard rubber during granulation. Caustics should not be used over larger surfaces or in greater concentration than necessary. The curative treatment consists in severing of bands; excision of the whole scar and union by suture; multiple small incisions, combined with dilatation; or insertion of healthy flaps from the neighborhood.

§ 11. **Vaginismus.**—Vaginismus is a painful tetanic contraction of one or more muscles surrounding the vagina. It is *superficial* or *deep*. In the former the spasm takes place at the entrance of the vagina and is probably located in the bulbocavernosus muscle. The latter is produced by the levator ani muscle. Vaginismus is nearly always due to some local disease of the genitals or neighboring organs. An unusually large penis or nervousness on the side of the male may offer the starting-point. The disease is also found as symptom of lead poisoning. In the superficial variety the spasm is called forth, not only by attempt at coition, but by the slightest touch. It may render a vaginal examination, the introduction of a speculum or of a catheter, impossible. The sphincter ani may partake in the contraction or general convulsions be elicited. These patients have, therefore, as a rule, an unbroken hymen, but the disease may develop even in women who have borne children. In the deep variety there is no difficulty at the entrance, but a spasm in the deep part of the vagina prevents further penetration; or, if it occurs after complete introduction, the corona glandis is encircled and withdrawal of the organ very painful to both parties to the act.

Prognosis.—The disease is curable.

Treatment.—First of all, any present abnormality must be removed. Sensitive carunculæ myrtiformes, urethral caruncles, or neuromas are cut off. Fissure of the urethrovesical junction is treated with hyperdistention, the application twice a day of a suppository containing a grain of cocaine, and painting with solution of silver nitrate. Fissures of the anus or the hymen should be covered with pledgets soaked in a 4 per cent. solution of chloral hydrate, or narcotic ointment; or they may be treated as those of the bladder. Other affections are remedied as described in other chapters of this book.

All attempts at copulation should be avoided. A general tonic treatment, with much muscular exercise in open air, should be followed, especially horseback riding and bicycling. Hip baths, hydrotherapy, sea baths, may all have a good effect. The removal of a fleshy hymen, followed by the application twice a day of a vaginal glass plug, generally results in prompt recovery. In some cases it is, however, necessary to cut the muscle-fibres encircling the vaginal entrance, either in the middle line or on both sides, leaving a space of $\frac{1}{4}$ inch between the two incisions.

Deep vaginism is treated by removal of the cause, especially a granular os. During the attack all attempts at separation should be avoided until spasms or erection have passed. A finger should be introduced into the anus of the woman, and if the contraction continues, she should be anæsthetized.

§ 12. *Neoplasms.*—A. Cysts are often found in the wall of the vagina. Generally there is only one, or at most a few. They are usually sessile. Their growth is very slow. The size varies from a pigeon's egg to a fetal head at term. Ordinarily they are movable and covered with normal mucous membrane. They contain a fluid, which may be serous, mucous, or purulent. They may rupture into the vagina or the bladder, or open in the perineum. They are of very different origin. Some are formed around extravasated blood. Others are dilatations of pre-existing hollows,—for instance, Gartner's canal,¹—and may then communicate with the parovarium.

¹ Gartner's canal is found in the cow and the sow. It is a development of the Wolffian duct. In woman it exists only as remnants in the broad ligaments and the cervix of the uterus. The discoverer's name is Gartner, not Gærtner or Gärtner, as the name is commonly spelled. He was born in St. Thomas, Danish West Indies, 1785. (Garrigues, "Gartner's Canals," N. Y. Med. Jour., March 31, 1883, p. 348.)

If they are small, they do not give rise to any symptoms. If large, they may be an obstruction to micturition, defecation, copulation, or childbirth, and cause a dragging sensation by their weight.

Diagnosis.—A *cystocele* is emptied by introducing a catheter into the bladder. In *emphysematous colpitis* there are numerous cysts which contain gas. From *solid growths* the cysts may be differentiated by their fluctuation or elasticity and the presence of a fluid that can be withdrawn by exploratory aspiration. *Hydatids* in the pelvis contain also a fluid; but it is clear like spring water and contains no albumin, but, perhaps, *echinococcus* hooklets or a piece of cuticula, recognizable by its parallel striation and lack of other structure.

Treatment.—The simplest is to make a longitudinal incision over the tumor, extirpate it, and unite the edges by suture. If it seems to be dangerously near the bladder, it is, however, safer merely to cut out the free portion of the wall and unite the two parallel curved edges of the wound with a running catgut suture, leaving the centre free, which gradually becomes like the rest of the vagina.

B. FIBROIDS (FIBROMA, FIBROMYOMA, MYOFIBROMA).—Fibrous tumors are rather rare in the vagina. They are composed of connective tissue, usually with an admixture of more or less unstriped muscular tissue. They start from the connective tissue around the vagina or its muscular wall. They may become softened by an accumulation of serum in their meshes. As a rule, there is only one tumor. At first it is sessile, but has a tendency to become pedunculated (*fibrous vaginal polypus*), and may then hang out from the vulva, when by friction it may become irritated and ulcerate. Commonly these tumors are small and have no symptoms. When they grow larger they give rise to leucorrhœa and hemorrhage, cause a dragging sensation, and oppose an obstacle in the way of micturition, defecation, copulation, and childbirth. Their growth is very slow.

Diagnosis.—*Cysts* are softer, and fluid may be withdrawn with an aspirator. *Uterine polypi* hang out through the os. *Sarcoma* grows rapidly, undermines the constitution, and has an entirely different histological structure.

Treatment.—A *pedunculated* fibroid tumor, except it acquires such proportions that it fills the vagina and makes access to the pedicle difficult, is easily removed. The pedicle may be surrounded by an elastic string and the tumor left to fall off. The pedicle may be trans-fixed with a needle carrying a double thread, which is cut in the middle, crossed, and tied in two halves, after which the growth is cut off. Or

the pedicle may be severed with an *écraseur*, the galvanocaustic wire or knife, or the thermocautery. If the tumor is sessile, an incision is made over its whole length, and it is peeled out, using the fingers and blunt instruments as much as possible in order to guard against hemorrhage. If the tumor is large, a piece of the mucous membrane is cut out by making two curved incisions, which join each other at their ends, and is removed with the tumor. After enucleation the wound is closed with deep sutures. If there is much hemorrhage, it is better to use a galvanocautery or thermocautery for the cutting and pack the sack with iodoform gauze, which is renewed daily.

C. MUCOUS POLYPI are still rarer than the fibroid polypi. They give similar symptoms. As they are very vascular, it is safest to tie the pedicle with an elastic ligature or transfix it as described above.

D. SARCOMA.—The vagina is rarely affected by sarcoma. Unlike other degenerations, sarcoma is not infrequent in youth and even in childhood. It may form a circumscribed tumor or be spreading along the surface. It grows in most cases rapidly. It causes leucorrhœa, hemorrhage, and pressure on neighboring organs. It ulcerates and undermines the general health.

Diagnosis.—The circumscribed form is like a fibroid, but develops faster, and the microscopic elements composing it are entirely different. The diffuse variety is much like carcinoma, and the diagnosis can only be made by means of the microscope.

Treatment.—The circumscribed form is extirpated like a fibroid. The diffuse is kept back by curettage and cauterization.

E. CARCINOMA (Fig. 160) is rarely *primary* in the vagina. Generally it is *secondary*, brought about by extension from neighboring organs, especially the cervix uteri, or as metastasis from remote parts. It may be *circumscribed* or *diffuse*. The former is a papillary growth, with the structure of an epithelioma. The latter may be medullary or scirrhus. The disease appears rarely before the patients reach thirty years of age. Like other malignant tumors, carcinoma grows fast, breaks down, and undermines the constitution. The ulcer may form a fistula with a neighboring organ. The inguinal and pelvic glands become infiltrated. The symptoms are foul discharge, hemorrhage, and pain.

Diagnosis.—The circumscribed, papillary form differs from *venereal vegetations* by its friability, its ulceration, and the free hemorrhage it gives rise to. The diffuse variety is like *sarcoma*, and can only be distinguished from it microscopically.

Prognosis.—The disease tends to death. Even after complete removal, relapses are common.

Treatment.—If seen in time, the tumor should be excised, even if it be necessary to encroach on the bladder and the rectum in doing so. The wound is then closed by deep sutures. It is best to extirpate the uterus at the same time. In most cases only a palliative treatment with curetting and cauterization is possible. Bleeding is checked by injections or tamponing. The odor is combated by disinfectants.

F. TUBERCULOSIS.—Tuberculosis of the vagina is more frequent than that of the vulva. It is nearly always combined with a similar affection of the uterus, and is chiefly produced on the posterior wall by stagnating fluid dribbling from that organ. Miliary nodules, ulcers, and caseous masses are found on the wall of the vagina, inclusive of the vaginal portion of the uterus. Frequently fistulæ leading to the bladder, urethra, or rectum are developed.

Treatment.—The treatment is the same as for tuberculosis of the vulva (p. 138).

§ 13. **Fistulæ.**—A fistula is an abnormal opening leading from the genital tract to the urinary organs or the intestine. In a more limited sense the word is applied only when the edge is covered with epithelium, excluding fresh tears or penetrating ulcers. Fistulæ are divided into *urinary* and *fecal*.

A. URINARY FISTULÆ.—These may be, 1, *vesicovaginal*; 2, *urethro-vaginal*; 3, *ureterovaginal*; 4, *vesico-uterine*; 5, *vesico-uterovaginal*; 6, *uretero-uterine*; or 7, *ureterovesicovaginal*.

FIG. 160.



Diffuse carcinoma of the vagina. (Schroeder.)

There may be one or more fistulæ, and in size they vary from a scarcely perceptible aperture to a hole admitting two fingers.

1. VESICOVAGINAL FISTULA.—This is the most common variety of fistula. It is nearly always due to childbirth,¹ and, if due to a tear, may appear immediately or, when produced by the expulsion of a plug of mortified tissue, days and weeks after confinement. A fistula may be produced by the obstetric forceps, but is much more frequently caused by delay in its use. It may result from operations, the burrowing of a pessary, or the spontaneous opening of an abscess.

The chief symptoms are a constant dribbling of urine and a disagreeable ammoniacal odor exhaled by the patient.

Diagnosis.—*Paralysis* of the sphincters of the urethra also causes enuresis. The presence of an opening must therefore be demonstrated. In most cases it can easily be felt or seen after the introduction of a speculum; but if it is very small or hidden in a recess, its existence may be proved by injecting the bladder with milk, which then makes its appearance in the vagina.

Prognosis.—Small fistulæ may sometimes heal spontaneously. Large ones can nearly always be closed by operation.

Treatment.—The treatment consists in cleanliness, cauterization, or operation. The vagina is douched with antiseptic fluid. The urine is prevented from becoming alkaline by the administration of medicines containing boric, benzoic, nitric, or phosphoric acid, or the benzoate of ammonium, lithium, or sodium. Calcareous incrustations should be removed mechanically and the raw surface smeared with some mild ointment and brushed over with a 2 per cent. solution of nitrate of silver twice a week. Sitz baths are taken once or twice a day. Cauterization is only of value in very small fistulæ, which may be touched with tincture of cantharides, nitric acid, carbolic acid, or lunar caustic. The chief and in most cases only remedy is the suture. The most favorable time for operating is about six or eight weeks after confinement. In order to obtain a good result it is often necessary to prepare the patient by cleaning her vagina or distending cicatrices with knife and dilators (p. 183). The general health should be brought to its highest possible point by food, wine, and tonics. Dyscrasias, such as anæmia, malaria, or syphilis, should have the appropriate treatment. The operation consists in denudation of the edges and union by sutures, usually of silver or silk. During the healing the bladder is kept empty with a permanent catheter or evacuated every four hours. The

¹ Garrigues, "Obstetrics," 1902, p. 778.

bowels are kept loose and the patient is given nutritious diet. The sutures are removed after 8 or 10 days.

The operation may be attended by considerable hemorrhage, which generally is arrested by a stream of hot or cold water, but sometimes it is necessary to tie an artery, which may be done by passing a suture under its course, which usually extends from the neck of the bladder or of the uterus. Secondary hemorrhage is very rare. It is combated by injections of hot or ice-cold water, powdered suprarenal capsule locally, stypticin or adrenalin by the mouth. Great care must be taken not to injure or ligate the ureter. If this is seen where the cutting has to be done, it is first split open and left to heal before the fistula is closed. If the fistula is very large, it is often impossible to close it in one line. The sutures are then placed so that when tightened they form a Y, a T, or an I. Sometimes the edges are denuded and united in different sittings. Often only partial success is obtained, when the operation has to be repeated.

All other urinary fistulæ are rare occurrences, but the physician should be able to diagnosticate them and in a general way know the resources of art to meet them.

2. A URETHROVAGINAL FISTULA may be closed by denuding the edges and passing sutures over a catheter held in the urethra.

3. A URETEROVAGINAL FISTULA is situated on the anterior wall of the vagina, a little below and outside of the vaginal portion of the uterus. It is fortunately rare, for it is difficult to remedy. It is diagnosticated by introducing a flexible catheter into the opening. In a ureteral fistula this will enter far in the direction of the kidney, and the urine will be ejected in intermittent spurts. Milk injected into the bladder does not come out through the fistula. Before closing the opening, the operator should ascertain that the ureter is perviable between it and the bladder. Otherwise he would produce hydronephrosis. The permeability is proved by introducing two silver probes, one through the ureter and the other through the urethra, which will come in contact in the bladder.

Treatment.—The fistula may be closed with suture or the ureter may be transplanted into the bladder. For this latter purpose the abdomen is opened, the ureter dissected free, an opening made in the posterior wall of the bladder, a fine catheter introduced into the ureter, the other end seized with a pair of forceps inserted through the urethra and drawn out through this canal. The ureter is then stitched to the opening in the bladder and a permanent catheter left

in this organ. In some cases the corresponding kidney has been removed.

4. VESICO-UTERINE FISTULA.—The cervix is the only portion of the uterus which can be connected with the urinary system through a fistula. The connection may be either with the bladder or with the ureter. The vesico-uterine fistula is a little round hole in the anterior wall of the cervix, remnant of a tear through the cervix and the base of the bladder which has healed partially. Urine is discharged through the os uteri.

Diagnosis.—It is of vital importance to distinguish the vesico-uterine from the *uretero-uterine* variety. Sometimes a probe may be inserted through the urethra and the fistula into the cervical canal, where it will come in contact with a sound passed through the os. Milk injected into the bladder comes out through the os uteri. If the cervix is plugged, no systemic disturbance occurs.

Prognosis.—This kind of fistula heals often spontaneously, its walls being so thick.

Treatment.—Cauterization has better chances than in other fistulae. If it does not succeed, the bladder is separated from the cervix as in vaginal hysterectomy (see below). The cervix is split and its edges, including the denuded fistula, sutured as in a common laceration of the cervix (see below). Next, the edges of the hole in the bladder are pared and the opening closed with deep and superficial silkworm-gut sutures.

5. VESICO-UTEROVAGINAL FISTULA.—In this variety there is a fistula going from the bladder through the anterior lip of the cervix and ending in the vagina. If there is left enough of the anterior lip of the cervix, it is pared and stitched to a similar denuded surface on the anterior wall of the vagina. If there is not tissue enough for this, the posterior lip is pared, so is the anterior circumference of the opening in the bladder, and then these are stitched together, turning the os into the bladder, and of course causing sterility, while the menstrual flow finds its outlet through the urethra.

6. URETERO-UTERINE FISTULA.—Here the connection is between the ureter and the cervix, and the urine dribbles through the os as in the vesico-uterine variety. This kind is exceedingly rare. Milk injected into the bladder does not come out through the os. If the cervix be plugged with a laminaria tent there will arise symptoms of hydro-nephrosis—lumbar pain, vomiting, fever, and swelling of the ureter. Another method, which causes the patient less annoyance, is to empty

the bladder with a catheter and place the patient on a bed-pan. After two hours the urine is again drawn, and the amount thus obtained will then equal that in the bed-pan, each being the product of one ureter.

Treatment.—Either the cervix must be turned into the bladder or the corresponding kidney must be extirpated.

7. URETEROVESICOVAGINAL FISTULA.—In this variety a part of the ureter has been destroyed and its opening is found on the edge of a vesicovaginal fistula. Before closing the ureterovaginal fistula the ureter is split open, so as to move the point where it debouches into the bladder farther back and gain room for the sutures.

Genital Cleisis.—If it is impossible to heal the fistula, no remedy is left for stopping the continuous dribbling of urine but to close the genital canal. We have already seen that the cervix under certain circumstances is turned into the bladder, which entails barrenness, but leaves the vagina its full length for copulation. If the fistula is situated in the vagina, this organ may be closed under it, as near to the fistula as possible and preferably in a slanting line, so as to occlude as little of the canal as feasible. For this purpose a narrow denudation is made on the anterior wall and a corresponding one on the posterior, which two surfaces are united by suture.

If for some reason or other no operation can be performed, the patient may derive some comfort by wearing a *urinal*—a rubber bottle fastened either inside or outside of her vagina.

Incontinence of Urine.—After complete healing of a fistula, or in cases in which there has been no fistula, the urine may dribble away through the urethra. The sphincters of the urethra may have been destroyed or a cicatricial band may pull the urethra open. This may be remedied by placing the patient in knee-elbow position, lifting the perineum with a Sims speculum, cutting out a curved, wedged-shaped piece on each side of and above the meatus (Fig. 161), and uniting the edges in such a way that the urethra is stretched from side to side, the posterior wall of the urethra brought up against the anterior, and the canal bent in the direction of the clitoris. In order not to comprise the anterior wall of the urethra in the sutures, a catheter is held in it while they are passed. When one side is healed the other is treated in the same way.

B. FECAL FISTULÆ.—A fecal fistula forms a communication between the genital canal and the intestine. They are much rarer than vesicovaginal fistulæ. The abnormal communication may be found between

the rectum and the vulva—*rectovulvar* or *rectolabial fistula*; between the ileum or the sigmoid flexure of the colon and the vagina or the uterus—*ileo vaginal*, *ileo-uterine*, or *enterovaginal fistula*. Like urinary fistulæ, a fecal fistula is commonly due to childbirth, more rarely to a pessary, an abscess, or external violence, especially coition. It may

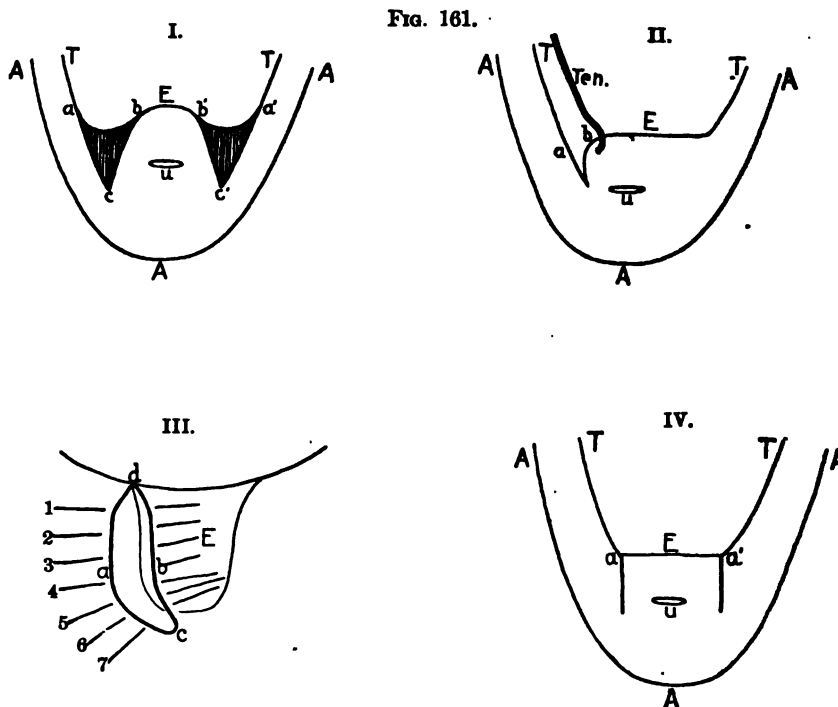


FIG. 161. Pawlick's operation for incontinence. I. Transverse section of the urethra. II. Posterior wall of the urethra being drawn with a tenaculum to determine width of denudation to be made. III. Front view of denudation. IV. Transverse tension accomplished. A, pubic arch; T, tissue covering the descending ramus of the pubis; E, elevation produced by the urethra; U, urethral canal; Ten, tenaculum; a b c and a' b' c', sections of denudations; a b c d, front view of denudation; 1 to 7, sutures.

arise immediately above a stricture, the rectum here being exposed to stretching and inflammation. A knuckle of intestine may be caught in a rent in the vagina or the uterus and become gangrenous. After perineorrhaphy an opening may remain at the upper end of the laceration. Syphilitic, cancerous, or tuberculous ulcers may also produce a fistula.

The escape of flatus and fecal matter through the vagina soon attracts the patient's attention and causes irritation of the mucous mem-

brane of the vulva and vagina. If the whole circumference of the intestine has been destroyed in an enterovaginal fistula, all the fæces, even solid, are expelled through the vagina (*preternatural anus*). If it is the ileum that is adherent, bile and undigested food may be evacuated through the opening and the patient's nutrition suffer seriously.

Fecal fistulæ vary much in size. Sometimes the opening is hardly visible, in other cases a finger may pass through it. Probes and injection of milk help to trace their course. When a whole intestinal knuckle has been destroyed, there are two openings, separated by a so-called *spur*. Fecal fistulæ heal oftener spontaneously than do urinary ones; but, on the other hand, success is more difficult to obtain in operating, because infection is likely to take place from the rectum.

Treatment.—Much can be done to *prevent* the formation of these fistulæ. In every confinement the bowels should be emptied with a soap-suds enema. The form of the pelvis should be carefully examined with regard to any narrowness or projecting points, and, if necessary, proper measures taken to avoid continuous pressure by a timely use of the forceps, delivery by version, pubiotomy,¹ Cæsarean section, or craniotomy. Pessaries should be kept clean by daily vaginal injections, and should be removed at least every two months. If there is any gnawing, the instrument should be left out and antiseptic injections used until the membrane is healed, before the pessary is readjusted. Abscesses should be opened in time. Ulcers should be treated locally and constitutionally.

Curative Treatment.—Sometimes cauterization or an elastic ligature will cause a fecal fistula to heal. If there is a stricture, the full calibre of the rectum must be re-established before closing the fistula. A low rectal fistula may be cured by overdistending the sphincter ani, making a curved incision, with the convexity turned downward, above the fistula, another below it, denuding the circumscribed semilunar piece of mucous membrane, drawing the upper edge down, and uniting it with sutures to the lower (Fig. 162, A, B). As a rule, rectovaginal fistulæ are operated on from the vagina. If the fistula is situated high in the rectovaginal septum, a triangular denudation may be made and the wound closed over the fistula (Fig. 163), or an oval denudation may be made around the opening and closed with transverse sutures. If an enterovaginal fistula implicates only a side of the intestine, it may be treated by denudation and

¹In its modern shape, performed with Gigli's wire saw, this operation has replaced symphyseotomy.

suture like any other fistula; but if it comprises the whole lumen of the intestine, the operator must ascertain that the intestine below the fistula is perviable. If it is, the spur may be cut with Dupuytren's enterotome, and the borders of the fistula denuded and united by

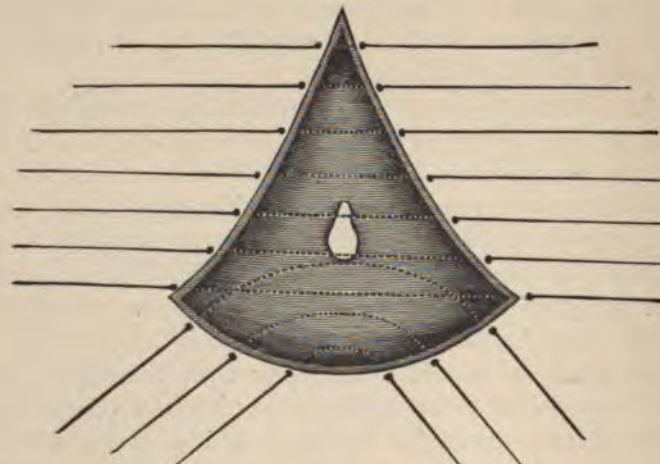
FIG. 162.



Operation for rectovaginal fistula. (Fritsch.) A, denudation and insertion of sutures; B, sutures closed, the flap covering the fistula. The arrow indicates that the flap is pulled down to the lower edge of the denuded surface. F, fistula.

suture. Or laparotomy may be performed, the intestine loosened, and the ends brought together. If the lower end of the small intestine is closed or too narrow, an anastomosis may be made between the upper

FIG. 163.



Operation for rectovaginal fistula. (Schauta.)

end and the large intestine. Perhaps the upper part may be loosened from the vagina and inserted into the rectum; or, after having made an artificial rectovaginal fistula, the vagina may be closed under it.

General Remarks about Operations for Fecal Fistula.—The bowels should not only be emptied, but disinfected with local and internal antiseptics. During the operation the field should be kept clean by means of irrigation with a similar fluid. The patient should be in the breech-back position. The fistula is made accessible by introducing a speculum under the symphysis and lateral retractors. It is best to use submucous buried catgut sutures for the rectum and silver wire or silkworm gut in the vagina. The bowels are moved on the fourth day, and thereafter kept loose, as in perineorrhaphy. The patient may urinate if she is able to do so.

CHAPTER IV.

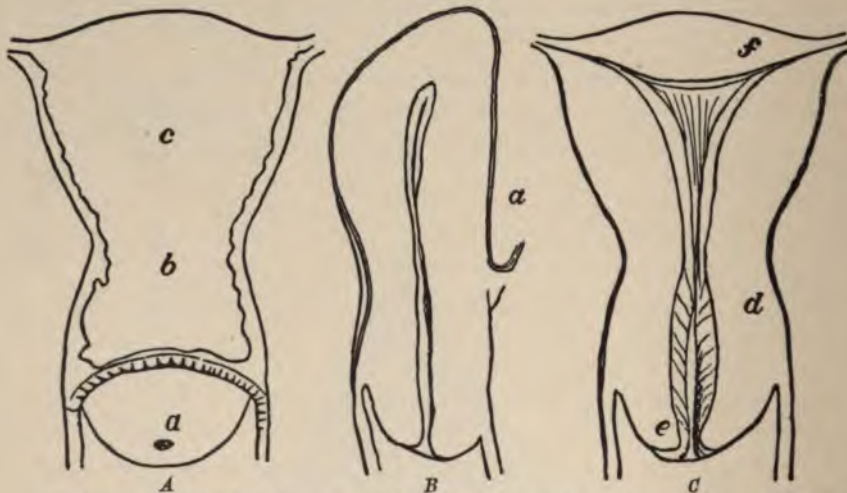
DISEASES OF THE UTERUS

§ 1. **Malformations.**¹—The normal uterus is represented in natural size in Fig. 164. The malformations of the uterus may be due to excess, arrest, or irregularity of development.

A. **EXCESSIVE DEVELOPMENT.**—The infravaginal portion of the cervix may be much elongated and even protrude penis-like from the vulva (Fig. 165).

B. **ARREST OF DEVELOPMENT DURING THE FIRST HALF OF INTRA-UTERINE LIFE.**—All the different forms of malformed uterus belonging to this

FIG. 164.



Virgin uterus. Slightly below natural size. (Sappey.) *A*, front view; the appendages and vagina are cut off; *a*, the vaginal portion of the cervix with the os externum; *b*, isthmus; *c*, body. *B*, the same in vertical mesial section: *a*, anterior surface; the letter is placed a little above the bottom of the vesico-uterine pouch. *C*, the same with cavity exposed by coronal section: *e*, os externum; *d*, os internum; *f*, fundus, the letter placed just above the uterine opening of the Fallopian tube.

class are easily understood if one bears in mind that the organ normally is built by the fusion and development of the two Müllerian ducts (Fig. 166).

1. **Absence of Uterus.**—Total absence of the uterus is very rare.

¹ Garrigues, "Malformations of the Female Genitals," Mann's System of Gynecology, 1887. Philadelphia, Lea.

2. *Rudimentary Uterus*.—In other cases the uterus is represented only by small, more or less formless, masses.

Patients with rudimentary uterus do not menstruate, but may have molimen.

3. *Uterus Duplex Separatus*, or *Uterus Didelphys* (Fig. 167).—This variety is produced when the two Müllerian ducts do not even touch each other in that portion of their course in which they normally blend to form the uterus (Fig. 168). Each half of the uterus has a tube, a round ligament, an ovary, and a cervix. The vagina may be double, single, or defective. Pregnancy and childbirth may take a normal course.¹ It is hardly possible to distinguish the uterus didelphys from a uterus bicornis through the abdominal wall.

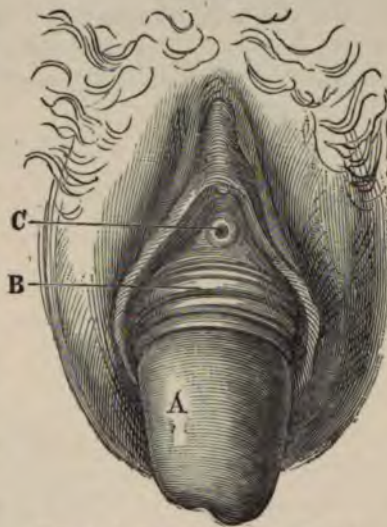
4. *Uterus Unicornis* (Fig. 169).—The one-horned uterus is the result of the development of one Müllerian duct, while the other one remains rudimentary or is absent. The uterus is long, turned to one side, and ends in a point, without fundus. By bimanual and rectal examination the diagnosis can sometimes be made. Pregnancy and childbirth in the developed horn may take an entirely normal course, while gestation in the rudimentary horn is a most dangerous condition.² The rudimentary horn may be long and narrow like a tube, but the starting-point of the round ligament constitutes the boundary between the two. The rudimentary horn may also be the seat of a collection of menstrual blood—*hæmatometra*. The treatment consists in ablation of the rudimentary horn by abdominal section (see MYOMA).

5. *Uterus Bicornis*.—If the Müllerian ducts remain separate in the upper part of what normally should form the uterus, this organ appears with two horns at its upper end (Fig. 170). The cervix may be double or single.

¹ Garrigues, "Obstetrics," 1902, p. 278.

² Ibid., p. 279.

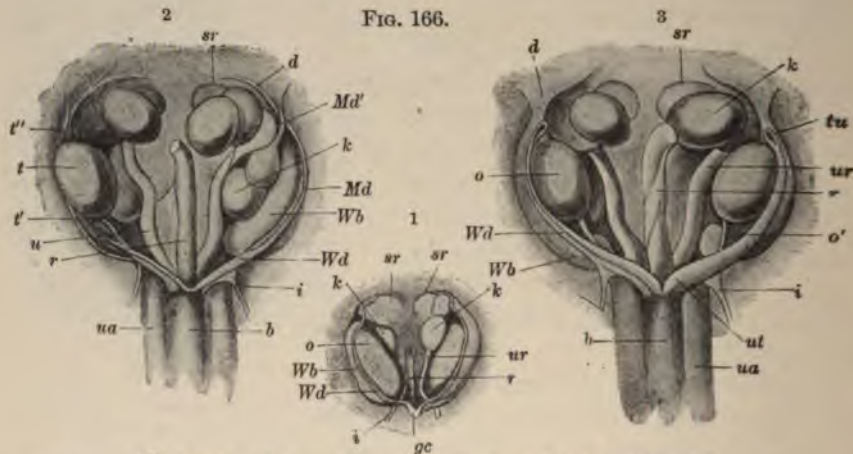
FIG. 165.



Elongated protruding cervix. (Hirst.) A, cervix; B, body of uterus covered by vagina; C, meatus urinarius.

6. *Uterus septus* or *bilocularis* has the outer shape of a normal uterus, but inside it is divided by a partition in the median line into two separate compartments. If the septum is incomplete, the uterus is called *subseptus* (Fig. 171).

In all varieties of double uterus the vagina may be single or double. The menstrual flow may come alternately from either side or from both sides simultaneously. Pregnancy may also occur in one or both halves and take its normal course.



The genital and urinary organs of the embryo of cattle. (Köl liker.)

1. From a female embryo, $1\frac{1}{2}$ inches long (double size). Wb, Wolffian body; Wd, Wolffian duct; i, inguinal ligament of Wolffian body; gc, genital cord; o, ovary; k, kidney; sr, suprarenal capsule; ur, ureter; r, rectum.

2. From a male embryo, $2\frac{1}{4}$ inches long (nearly three times natural size). The left testicle has been removed. Letters as in No. 1, and besides Md, Müllerian duct; Md', upper end of the same; t, right testicle; t', lower ligament of testicle; t'', upper ligament of testicle; d, diaphragmatic ligament of Wolffian body; ua, umbilical artery; b, bladder.

3. From a female embryo (enlarged nearly three times). Letters as in Nos. 1 and 2, and besides tu, opening of the upper end of the Müllerian duct (tube); o' lower ovarian ligament; ul, thickened part of the Müllerian duct, which becomes the horn of the uterus.

The presence of double uterus explains probably many cases of supposed superfetation.¹

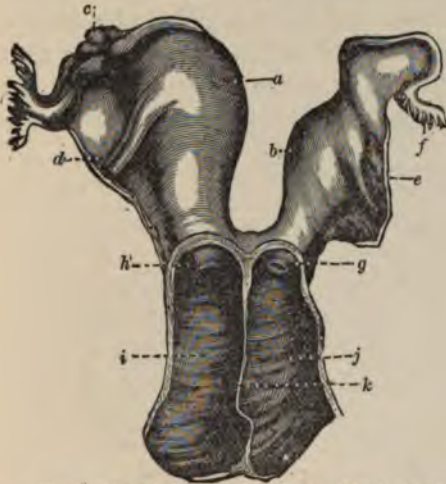
Diagnosis.—The diagnosis of a two-horned uterus may sometimes be made by bimanual examination or from the rectum. The presence of a septum may be ascertained by the simultaneous introduction of a sound into each half. If the partition is incomplete, the sounds may be brought in direct contact with each other.

7. *Atresia Uteri.*—The mucous membrane of the vagina may ex-

¹ Garrigues, "Obstetrics," 1902, p. 257.

tend over the lower end of the uterus without forming an os externum. Or the whole cervix may be untunnelled. In a bicornute uterus one horn may be closed. The closure of the uterine canal causes symptoms similar to those of an imperforate hymen

FIG. 167.



Uterus didelphys. (Olivier.) *a*, right body; *b*, left body; *c*, right ovary; *d*, right round ligament; *e*, left round ligament; *f*, left tube; *g*, left cervix; *h*, right cervix; *i*, right vagina; *j*, left vagina; *k*, partition between the two vaginæ; *l*, right tube.

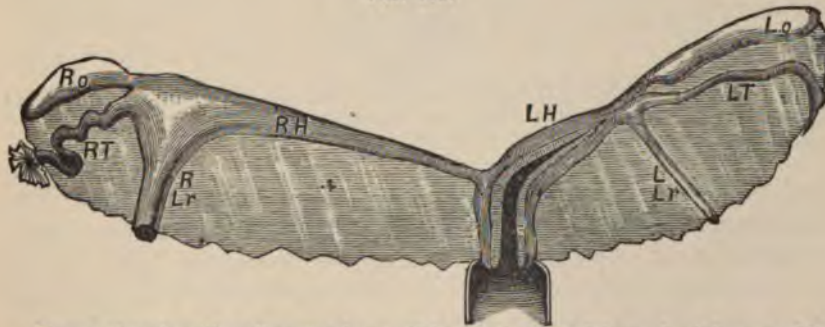
FIG. 168.



Ovaries, tubes, and uterus of human fetus from the tenth week, twenty-six millimetres long. (H. Meyer.) 1, natural size; 2, enlarged four times. *a*, round ligament; *b*, rectum.

or atresia of the vagina, but the vagina is open, and above it is felt a tumor due to the accumulation of the menstrual flow.

FIG. 169.



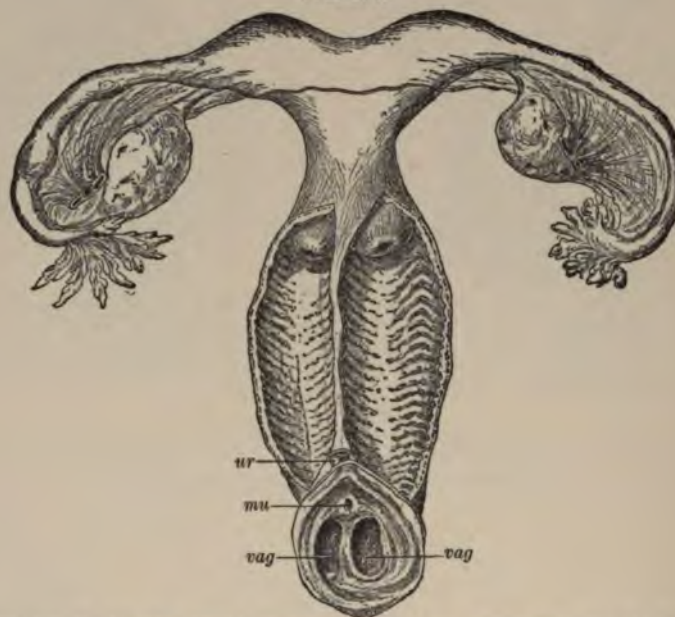
Uterus unicornis, with rudimentary horn. (Schroeder.) *LH*, left horn; *Lo*, left ovary; *LLr*, left round ligament; *RH*, right horn, rudimentary; *RT*, right tube; *Ro*, right ovary; *RLr*, right round ligament.

Diagnosis.—In pregnancy the patient will generally have menstruated before being fecundated, and there will be the usual signs of

pregnancy. A *myoma* forms a hard, nodular mass. *Hæmatocele* arises suddenly, and constitutes a broader tumor, which crowds the uterus forward.

If the uterus is double, menstruation may continue from the open half, but is accompanied by molimen and the formation of a lateral tumor, increasing in size every month. Blood may accumulate also in the corresponding tube, and either this or the uterus may rupture. The least dangerous is the establishment of a communication with the

FIG. 170.



Uterus bicornis. (Hunkemüller.) *ur*, urethra cut off; *mu*, meatus urinarius; *vag*, entrances to the double vagina, the anterior wall of which has been removed, showing the two vaginal portions of the two-horned uterus.

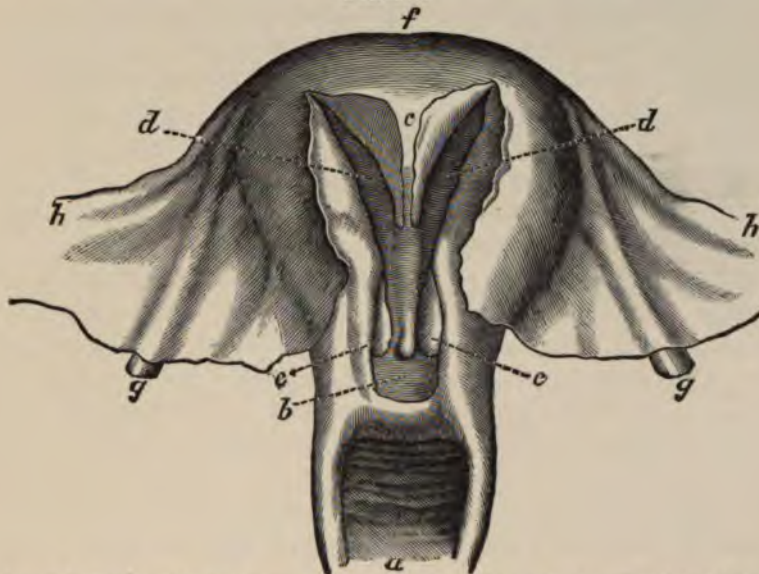
open half of the uterus; but even the pyogenic microbes enter. The contents become purulent (*pyometra*), or gas may develop (*physometra*). Exceptionally the fluid in a closed horn is only mucous (*hydrometra*).

Treatment.—If the uterus is single, the cervix should be perforated with a trocar and the opening thus made enlarged with incision in different directions with Simpson's metrotome (Fig. 172), and with an expanding dilator. The uterus should be emptied and cleansed as in atresia hymenalis, hemorrhage checked by packing with iodoform gauze, and the canal kept open by leaving a perforated glass stem

(Fig. 79, p. 73) in it during the healing process. Later a curettage may be indicated to combat endometritis.

In a double uterus of which one half is closed it is best, if possible, to operate through the cervix. If not, the uterus is punctured from

FIG. 171.

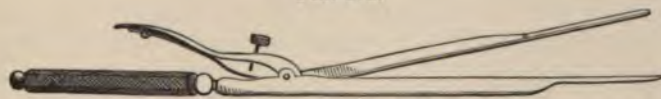


Uterus subseptus. (Gravel.) *a*, vagina; *b*, single os uteri; *c*, uterine septum; *d d*, right and left uterine cavity; *e e*, ridges on the mucous membrane of the cervix; *f*, fundus; *g*, round ligament; *h*, tube.

the vagina; but when sufficient space has been obtained, the partition should be incised or a piece cut out of it, so as to insure permanent communication with the open half of the uterus.

If the tumor cannot be reached from the vagina, laparotomy should

FIG. 172.



G. TIZMAN-CO.
Simpson's metrotome.

be performed and the closed horn or the whole uterus amputated. (See MYOMA.)

If blood has collected in a tube, it may be left alone for a time, in the hope that it may disappear; but if the tumor grows, it should be opened and drained from the vagina. If it is far away from the latter,

laparotomy may be tried and, if possible, the tube extirpated or drained through the vagina.

C. ARREST OF DEVELOPMENT DURING THE SECOND HALF OF INTRA-UTERINE LIFE.—The uterus may be too small. There are two varieties of this deformity: in the *fetal*, or *infantile*, uterus (Fig. 173) the cervix

FIG. 173.



Ill-developed uterus, with fetal type.

preponderates in length over the body, while in the *pubescent* uterus body and neck have about the same length. As a rule, the woman does not menstruate, or she suffers from dysmenorrhœa or vicarious menstruation. Sexual appetite may be normal, but generally women with too small a uterus are sterile.

The *prognosis*, especially in regard to the sterility, is not very favorable.

Treatment.—The best remedy is the galvanic current, with the negative pole in the uterus. Besides that, a general tonic course should be followed. If the patient is anæmic, nothing should be used that tends directly to bring on the menstrual flow until the general health has been regained, as the loss by menstruation would only make the anæmia worse.

D. IRREGULAR DEVELOPMENT. — 1. *Obliquity*.—The uterus may be congenitally bent to one side (*lateroflexion*) or tilted to one side (*lateroversion*).

2. *Malposition*.—The uterus may be placed abnormally far forward (*ante-position*), or backward (*retro-position*), or to one side (*latero-position*).

3. *Hernia Uteri*.—In rare cases the uterus has been found in a congenital inguinal hernia. It is preceded by the ovary, which is drawn out through the inguinal canal by a process similar to the normal descensus of the testicle. It has been seen also in crural hernia. Pregnancy may occur in such a misplaced uterus.¹ If the condition is seen earlier and gives trouble, the uterus may be amputated.

§ 2. *Injuries*.—A. INJURIES OF THE BODY.—Sheltered in the depth of the pelvis, the unimpregnated uterus is little exposed to injuries from without. But when in pregnancy it rises into the abdominal cavity, it is easily reached by the horn of an animal, a knife, a bullet, etc. Attempts at abortion made by others or the patient herself may inflict such a serious wound that the intestine prolapses. Some uteri are so soft that they are perforated in introducing a uterine sound or a curette. The pregnant womb has been mistaken for an ovarian cyst

¹ Garrigues's "Obstetrics," 1902, p. 301.

and perforated with a trocar. During labor it may rupture if the parturient canal is obstructed.¹

Prognosis.—The perforation of the uterus with a sound or a curette is of little importance if the surgeon has worked aseptically and takes care not to inject any fluid, which would find its way into the peritoneal cavity. The wounds of the pregnant womb generally lead to abortion and sometimes peritonitis and death. Injuries inflicted without aseptic precautions often produce septicæmia.

Treatment.—If the uterus has been wounded from the vagina with a clean instrument, the patient should be kept quiet in bed for a few days. If there is any pain, an ice-bag should be applied to the abdomen, and an opiate prescribed. If the intestine is prolapsed, the abdomen should be opened, the intestine liberated, and the wound closed. Sometimes it may be necessary to resect a portion of the gut. Wounds through the abdominal wall should be cleaned, closed, and dressed, leaving the fetal sac undisturbed. If there are signs of internal hemorrhage, the cavity should be opened, the bleeding vessel tied, and the incision closed. If the pregnant uterus is accidentally wounded in performing a laparotomy and the ovum remains intact, the wound should be sutured, as, perhaps, gestation may not be interrupted; but if the fetal sac has been punctured, the uterus should be opened as in Cæsarean section and emptied.

B. LACERATION OF THE CERVIX.²—By far the most common injury of the uterus is that of the cervix, sustained in childbirth. The direction is commonly longitudinal, rarely transverse or even ring-shaped. The tear may be *complete*,—that is, penetrate the whole thickness of the vaginal portion; or *incomplete*, when it does not reach the vaginal surface. There may be one or more clefts. Most often there is one on either side of the os—*bilateral* laceration. Less frequently only one side is torn—*unilateral* laceration. The rarest is a tear in the middle of the posterior or the anterior lip. The laceration is called *stellate* when at least three tears form a star-like figure. It is *funnel-shaped* if there are several incomplete tears which leave a gaping os. It is *crescentic* if the anterior lip becomes hypertrophied and bulges into the canal. The unilateral is much more common on the left side, doubtless on account of the prevalence of the left occipito-anterior position of the fetus. The

¹Garrigues's "Obstetrics," 1902, p. 525.

²Garrigues, "Laceration of the Cervix Uteri," Archives of Medicine, October, 1881; "The Immediate Closure of Laceration of the Cervix," Amer. Jour. Obst., 1891, No. 11; "Obstetrics," p. 534.

tear may extend into the parametrium or the bladder, in which latter case it may give rise to a permanent vesicovaginal or vesico-uterine fistula. The rupture may heal by first or second intention; but often the union is incomplete, a cicatricial plug forming at the angle and the lower portion of the lips remaining separate. Or the wound unites from below upward, leaving a vesico-uterine or a uterovaginal fistula. The cervix itself, the body of the uterus, and the neighboring connective tissue become chronically inflamed. The cervical membrane often bulges out—so-called *ectropium*. The lips are more or less turned out and become often cystic by the occlusion of the outlets of the cervical glands or formation of hollows by invagination from the vaginal epithelium.

Symptoms.—The chronic inflammation resulting from a laceration generally causes menorrhagia, metrorrhagia, leucorrhœa, anæmia, often neuralgia, and sometimes even hallucinations, anorexia, and loss of flesh and strength. Often it leads to secondary sterility, or in following childbirths the cicatrix is slow to yield to dilatation.

Vaginal examination enables one to feel the tear and the everted lips, which often are studded with small, hard, shot-like protuberances, formed by the occluded glands. Pressure with the finger-nail in the angle of the laceration often causes severe pain at the place touched or in remote parts. The condition is seen best with a Sims speculum. By drawing the two lips together, the os, which has disappeared, is reproduced. A tubuliform speculum is apt to press the lips further apart and flatten them out, so that the inflamed mucous membrane of the cervix resembles an ulcer, for which it formerly was taken.

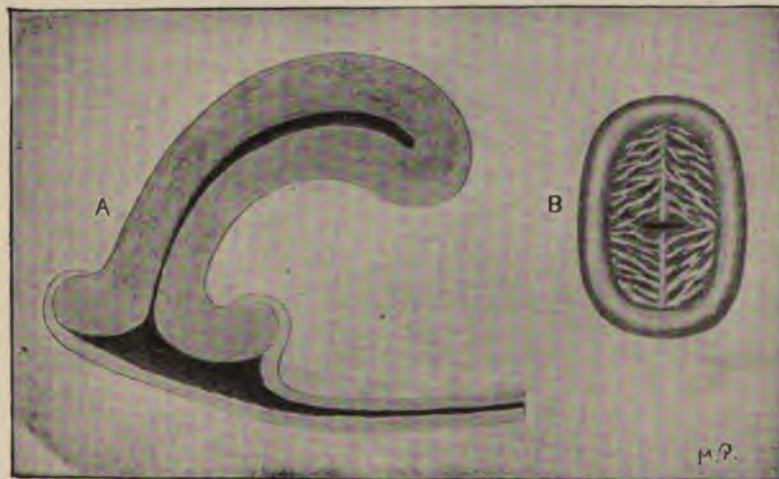
Diagnosis.—Some women have congenitally one or two clefts in the cervix. By *hypertrophy* of the lips a condition then may be brought about in a nullipara which closely simulates a laceration (Fig. 174), but there is no cicatricial tissue. When the cervix is very hard and gives rise to hemorrhage, the disease has been mistaken for *cancer* and the uterus has been removed, when microscopical examination failed to reveal any degeneration. In case of doubt, a small piece of suspicious-looking tissue should be cut out and examined with the microscope.

Prognosis.—Many fresh tears heal during the puerperium. Old tears may cause nervous troubles and impair the general health; and, worst of all, they predispose markedly to cancerous degeneration. When properly treated the prognosis is good.

Treatment.—The prophylaxis belongs in the domain of obstetrics. No ecbotic drugs should be used, nor should the forceps be applied

before the os is fully dilated, nor should undue pressure be exercised on the fundus before complete dilatation. The treatment of fresh lacerations belongs likewise to obstetrics. Old tears of small dimensions, mere nicks in the os, are so common that they may be regarded as a normal occurrence in childbirth. Somewhat deeper tears often disappear by the application of astringents to the mucous membrane of the cervix, such as liquor ferri chloridi, liquor ferri subsulphatis, ferripyrin, bathing with solution of cupri sulphas (10 per cent.), or

FIG. 174.



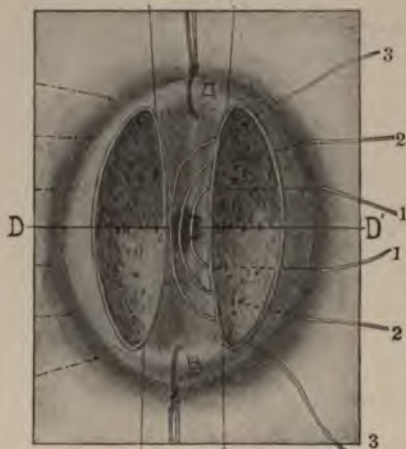
Hypertrophy of the vaginal portion in a virgin simulating a laceration of the cervix. A, side view of supposed sagittal section; B, the cervix seen from below.

the introduction of a tampon soaked in glycerite of tannin (8-10 per cent.), combined with hot douches. The same treatment suffices for most unilateral tears.

Large bilateral tears should be denuded and united by sutures, an operation called for its inventor, Dr. Thomas Addis Emmet, of New York, Emmet's operation, or, anatomically, *hysterotrachelorrhaphy*,—womb-neck sewing,—often abbreviated to *trachelorrhaphy*. Before operating, a *preparatory treatment* is often indicated. The inflammation of the mucous membrane should be combated with astringent applications, tampons, and injections, and cysts should be pricked open and painted with tincture of iodine. If circumstances do not allow so protracted a procedure, the whole mucous membrane may be cut off or the cervix may be amputated.

For trachelorrhaphy (Fig. 175) the pubic hair is shaved off; the patient is placed in the dorsal position, with elevated and separated legs, held by Robb's leg-holder or some other arrangement; and the vagina is disinfected. Garrigues's weight speculum is introduced, and an anterior blade placed in front of the cervix, which is seized at the right side with a bullet-forceps. Next, a curved trocar-pointed round needle (Fig. 101 *f*, p. 92), $1\frac{1}{2}$ inches long, $1\frac{1}{4}$ the straight distance from end to end, held in a needle-holder and carrying a strong silk thread, is inserted in the

FIG. 175.



Trachelorrhaphy. *A*, anterior lip; *B*, posterior lip; *C*, cervical canal; the numbers mark the order in which the sutures are inserted. If the reader will copy the figures on a piece of paper and fold it at the line *D D'* he will see the effect of the whole operation.

middle line of the posterior lip from behind forward, about $\frac{1}{4}$ inch from the end of the lip. The string is then knotted at the cervix and near its other end, leaving a large loop. The same is done with the anterior lip, and the bullet-forceps removed. These two guys serve to draw the uterus down or to one side, to separate or approach the lips, to mark the canal which is to be left open; and they facilitate the operation very much. A tenaculum is hooked into the left lateral portion of the posterior lip, and with a scalpel a piece of mucous membrane and muscular tissue is cut under the tenaculum. The loose flap is seized with a tissue-forceps and the incision continued into the angle between the lips. Or before the denudation the angle may be cut with a pair of scissors. When the first piece is loose, a similar denudation is made opposite to it, on the anterior lip, and thereafter similar surfaces pared on the right side. Between the raw surfaces should be left a somewhat funnel-

shaped portion of mucous membrane, which at the angle has the width of the cervical canal and at the end is half an inch from side to side, as contraction always takes place later and leaves too narrow an os, if no allowance has been made for shrinkage. All cicatricial tissue should be cut out. The denuded surfaces bleed freely, but there is no hemorrhage of consequence, and all bleeding ceases when the sutures are tightened. But beginners should be careful not to make their denudation so wide that it reaches the vaginal surface of the vaginal portion. The first suture is introduced near and parallel to the angle on the left side of the posterior lip, from $\frac{1}{4}$ inch outside of the denuded surface to a point on the boundary-line between the raw tissue and the portion left undenuded for the cervical canal. Next, the needle is made to pursue a similar course from within outward on the anterior lip. The ends are tied together and temporarily put aside behind the wing of the speculum. A second suture is inserted parallel to the first about $\frac{1}{4}$ inch nearer the end. The third is placed near the future os and slanted a little. The passage of the needle may be much facilitated by passing a counter-pressure hook (Fig. 107, p. 95) under the point when it appears. The best suture material is chromicized cumol catgut (Van Horn & Sawtell's No. 3). Before closing the sutures the denuded surfaces should be irrigated and clots removed.

If one lip is longer than the other, the position of the angle must be shifted over on the longer one. If the lips are adherent to the vagina, they must be loosened by incision and the gap covered with iodoform gauze. This is under all circumstances packed loosely over the cervix. The patient may urinate. The bowels are, if necessary, kept open. On the fourth and the seventh days the gauze is changed and the vagina swabbed with an antiseptic fluid. On the tenth day the sutures are removed, unless they have been absorbed.

§ 3. Foreign Bodies.—Foreign bodies are far less common in the uterus than in the vagina. Still, a glass catheter used for injection may break in it, or a hair-pin and similar objects used to provoke abortion may slip into the cavity. A leech applied to the cervix may also crawl in.

Treatment.—As a rule, it is necessary to anæsthetize the patient, dilate the cervix, and withdraw the foreign body with a forceps. A leech lets go its grip by strewing salt on it or injecting a strong solution of the same into the uterine cavity. If there is any bleeding, the uterus should be packed with iodoform gauze, and if that does not

suffice, the vagina, too, should be tamponed with cotton wrung out of creolin emulsion.

§ 4. **Metritis.**—The inflammation of the uterus is called metritis. It may be *acute* or *chronic*.

A. **ACUTE METRITIS.**—In the acute form of inflammation the whole organ—body, neck, mucous membrane, muscular coat, and often the peritoneum—is implicated. The inflammation of the mucous membrane, or endometrium, is called *endometritis*; that of the muscular tissue, *parenchymatous metritis*; that of the peritoneal covering, *perimetritis*.

Pathological Anatomy.—The uterus is enlarged and soft. The endometrium is red and swollen. The cut surface of the wall is red, interspersed with fine yellow points. The microscope reveals an abundant infiltration with small round cells, both in the mucous membrane and between the muscle-fibres, dilated blood-vessels, and extravasated blood. If the inflammation reaches the peritoneum, it generally extends to other organs, and will be described later under pelvic peritonitis. It ends in resolution, induration, or, in puerperal cases, supuration.

Etiology.—The most frequent cause is puerperal infection in childbirth or abortion. Other causes are exposure, especially during menstruation; coition during menstruation or involution; decomposition of retained blood; operations, such as curettage, incision of the cervix, trachelorrhaphy, with defective asepsis; the use of tents; and gonorrhœa. Acute metritis appears also in exanthematous fevers, typhoid fever, cholera, and other severe acute diseases, as well as in syphilis.

Symptoms.—The patient has fever and a sensation of heat, bearing-down, and sometimes painful contractions in the pelvis, called *cramps*. The pain generally extends to the lumbar region. Micturition and defecation are often painful. Vomiting and diarrhœa may be present. Frequently there is suppression of the menses, menorrhagia, metrorrhagia, or a purulent discharge from the uterus, especially in gonorrhœa. The abdomen is bloated and tender. By vaginal examination the uterus is found swollen and sensitive, the os dilated and often eroded.

Prognosis.—As a rule, the disease ends in recovery in from two to four weeks, but the possibility of the development of peritonitis by the extension of the inflammation through the tubes or the lymphatics must make the prognosis somewhat guarded.

Treatment.—The *prophylaxis* is self-evident, if we bear the causes

in mind. Women should avoid bodily fatigue and exposure to cold during menstruation and during the period of involution after abortion or childbirth. Coition during menstruation or within a month after abortion and two months after childbirth is to be eschewed. Accouchements and gynecological operations should be performed under strict adherence to the rules of asepsis and antisepsis.

Curative Treatment.—The patient should remain in bed, at first on fluid diet. An ice-bag or ice-water coil is placed on the abdomen, unless the patient was menstruating at the outbreak of the disease, when a warm poultice or stupe is substituted. It is well to give a saline aperient and an opiate to combat pain. Vaginal douches of plain water, slippery-elm, or linseed decoction of 100° to 105° F. should be given three times a day. When the most acute symptoms have subsided, a warm sitz bath of 110° F., once or twice a day for ten minutes, or a general warm bath every other day, is also useful. The ice-bag is then replaced by a Priessnitz compress, a tampon with ichthyol glycerin is inserted in the vagina, and the roof of the organ is painted every other day with tincture of iodine. In regard to gonorrhœal metritis, see VENEREAL DISEASES.

DIPHTherITIC METRITIS.—This variety is characterized by a yellow exudation on or in the mucous membrane of the uterus. It is most frequently found in puerperal infection, and is then due to streptococci and staphylococci; but it appears also in general diphtheria, when the bacillus diphtheriæ is present; or combined with gangrene of the vagina in scarlet fever, typhoid fever, cholera, and other infectious diseases.

In puerperal cases the yellow infiltration may extend as a layer from the endometrium to the peritoneum and scoop out a large piece of the musculature of the organ—*dissecting metritis* (Fig. 176).

Diphtheritic metritis is, as a rule, combined with a similar process in the vulva and the vagina, and may be seen with the speculum as yellow spots or streaks in the cervical canal. Dissecting metritis cannot be diagnosed until the loose body, consisting of muscular fibres, is expelled, but its existence may be surmised, when diphtheritic metritis is followed by an unusually protracted purulent discharge.

Treatment.—The whole surface of the cervical membrane should be cauterized once with a 50 per cent. solution of chloride of zinc, the uterine cavity washed out once daily with carbolized water, and a suppository with iodoform carried into the fundus with a pair of forceps and left in the uterine cavity:

R Iodoformi, \mathfrak{z} iii (12 grammes);
 Amyli, \mathfrak{z} ss (2 grammes);
 Glycerini, fl. \mathfrak{z} ss (2 grammes);
 Acaciæ, \mathfrak{z} i (4 grammes).—M.

Divide in 3 suppositories of the size and shape of the little finger.

B. CHRONIC METRITIS.—The chronic form of metritis attacks sometimes chiefly the mucous membrane, and is then call *endometritis*. In

FIG. 176.



Dissecting metritis. Specimen expelled on the twenty-sixth day after childbirth, consisting of muscular tissue folded together so as to take the shape of the uterine cavity. Length, folded, 3 inches (8 centimetres). (Author's collection.)¹

FIG. 177.



Mucous polypi. (De Sinéty.) V, vagina; U, uterus; P P, polypi.

other cases the inflammation is found chiefly in the muscular tissue, and is then termed *parenchymatous metritis*.

1. CHRONIC ENDOMETRITIS.—*Pathological Anatomy*.—The mucous membrane is swollen, soft, dark red, or slate-colored. In some places are found extravasations of blood. On account of its increase in extension, it does no longer find room in the interior of the cavity, and bulges out at the os, forming an *ectropium*. The glands of the cervix often become occluded and form small cysts, known as *ovula*

¹ I have seen and described eight such cases. "Dissecting Metritis," New York Med. Jour., 1882, vol. xxxvi. p. 587. Archives of Medicine, April, 1883. Medical Record, vol. xxiv. p. 664.

of *Naboth*, and containing a fluid like the raw white of an egg. The interior of the body is puckered, or raised in ridges or club-shaped protuberances, called *mucous polypi*, and similar excrescences may be attached to the wall of the cervical canal and hang out from the os (Fig. 177). Such proliferation of tissue is designated *hyperplastic*, or *fungoid*, *endometritis*. The os is frequently surrounded by a red area, and similar red spots are found also further away from the os, on the vaginal portion. They are termed *erosions*, but are really due to a change in the epithelium from flat to columnar. The mucous membrane is uneven, studded with small elevations, which constitute a so-called *granular os*. Microscopical examination shows a great develop-

FIG. 178.



Glandular endometritis. (Wyder.)

ment of utricular glands (Fig. 178), infiltration with small round cells, and dilated blood-vessels. Later the mucous membrane becomes atrophic, the glands become rare and are replaced by connective-tissue fibres (Fig. 179).

The so-called *erosions* show under the cylindrical epithelium infiltration with round cells, as all inflamed tissues. By invagination of the epithelium, follicles, and tubules—that is, new glands—are formed (Fig. 180), and when the opening becomes obstructed, cysts are developed.

Etiology.—In the chapter on etiology in general we have seen the deleterious influence of improper clothing, exposure, or coition during

menstruation, unnatural sexual relations, childbirth, abortion, and gonorrhœa (pp. 5-8), all of which particularly may result in chronic endometritis. The pressure and abrasion caused by the passage of the child often lead to chronic endocervicitis, especially if the cervix is torn. Parts or the whole of the decidua may, after childbirth or abortion, remain adherent to the endometrium and constitute a so-called *decidual endometritis*.

In old age the mucous membrane of the uterus becomes atrophic, the epithelium changes from columnar to flat, there is a profuse purulent discharge—*atrophic endometritis*; or the canal may become closed

FIG. 179.



Interstitial endometritis, with partial atrophy of the glands. (Wyder.)

by coalescence of the opposed walls, especially at the internal os, when the discharge is pent up and constitutes a condition known as *senile pyometra*. Microbes do not seem to be a factor in the chronic inflammation of the uterus.

*Symptoms.*¹—Most patients complain of neuralgic pains in different parts of the body (p. 11), "*bearing-down*,"—that is, an unpleasant sensation of heaviness extending from the interior of the pelvis to the external genitals,—and sometimes "*cramps*,"—a painful contraction of

¹Garrigues, "Symptoms, Diagnosis, and Treatment of Chronic Endometritis," Times and Register, 1892, vol. xxiv. No. 18, p. 451.

the muscular tissue of the womb,—in the effort of expelling pent-up fluid or a solid body from its interior. Not unfrequently there is photophobia, a painful pricking sensation in the eyes, or occipital pain. Often an unpleasant sensation in the bladder necessitates frequent micturition, a condition called *irritable bladder*. Dysmenorrhœa is common.

Generally, there is an abnormal loss of blood, either menorrhagia or metrorrhagia. When this is a prominent symptom, the disease is called *hemorrhagic endometritis*. In very weak patients there may, on the contrary, be amenorrhœa.

The women usually have more or less leucorrhœa. The secretion from the cervix is thick and glairy, like raw white of an egg; that

FIG. 180.



Chronic inflammation of the vaginal portion. (Cornil.) Enlargement, 200. *a*, cylindrical epithelium; *b*, invagination of the epithelium; *c*, connective tissue.

of the body more milky. Both are alkaline and may become purulent or blood-stained. When the leucorrhœa is a chief symptom, the disease is termed *catarrhal endometritis* or *catarrh of the uterus*.

Some have a profuse, watery discharge—*hydrorrhœa*. The passage may at times become obstructed, either through swelling of the mucous membrane or muscular contraction at the os internum, when the fluid accumulates above the barrier and causes cramps until the impediment is overcome and the woman is relieved. Outside of pregnancy, this is a rare condition. It may, however, occur also after childbirth—*puerperal hydrorrhœa*—and is then commonly due to a retained part of the placenta, clots, or a polypus.

Patients suffering from chronic endometritis lose their appetite, are constipated, and have a pale or yellow complexion, with dark rings

under the eyes. Often they complain of dyspnoea or palpitation, or are depressed and melancholy. Frequently they become sterile, or the implantation of the ovum far down may give rise to placenta prævia.

By vaginal examination the cervix is generally found enlarged, either softer or harder than normal; the former if cell infiltration or formation of glands predominates, the latter if much connective tissue has developed. It is often torn. The os is large, velvety, or in nulliparous women too narrow, causing retention of mucus. The uterus is tender on pressure. If a sound is introduced, it causes unusually severe pain and often reveals an uneven surface or the presence of polypi or ridges.

Diagnosis.—In *lumbo-abdominal neuralgia* the uterus may be sensitive, especially in the region of the internal os, but there is no leucorrhœa or hemorrhage. A *myoma* is often accompanied by these symptoms, but then the tumor can be felt. A *fibroid polypus* can be diagnosed with the sound. The differentiation from beginning *carcinoma* may be difficult. In this the neoplasm is so friable that a small portion of it may be detached by the mere examination. Around the new growth is an indurated ring as hard as a board. Sometimes pieces of the neoplasm may be expelled spontaneously from the interior of the uterus. Bleeding occurring after the menopause is very suspicious. Pain need not be present. If there is any doubt, a small piece should be cut out of the cervix, or scrapings gained by curettage of the cavity of the uterus. These should be hardened and sections examined with the microscope, when the different histological composition will settle the question. A bloody, purulent, offensive discharge may be found in endometritis and is not sufficient for the diagnosis of malignant disease.

Prognosis.—Chronic endometritis has, upon the whole, a good prognosis; but the leucorrhœa may be stubborn, and in regard to sterility the outlook is doubtful.

Treatment.—The prophylaxis requires avoidance of the errors leading to the disease, as mentioned above. Patients suffering from chronic endometritis need much rest. They must abstain from fatiguing exercise, and should not walk so far as to increase their pain. Sexual intercourse should be much limited. The bowels should be kept open. The patient should take as much substantial food as she can digest and moderate amounts of wine or beer. Stout women derive much benefit by the use of an abdominal supporter, which takes off some of the pressure of the abdominal organs on the uterus. Sea-baths or hydrotherapy has an excellent effect on hemorrhage and

leucorrhœa. A warm bath twice a week soothes the nerves, a daily warm sitz bath may also be useful for a time. Sponge baths, towel baths, sheet baths, and shower baths are also good.

The disease being of long duration, narcotics should be used very sparingly. It is much better to strengthen the nerves and produce better blood by tonics. The troublesome backache is temporarily relieved by rubbing the lumbar region with chloroform, diluted with three parts of olive oil, or a mild counter-irritant like this:

R Chloroformi, $\overline{\text{ss}}$ (15 grammes);
Spts. ammoniæ, $\overline{\text{ii}}$ (8 grammes);
Spts. camphoræ, q. s. ad $\overline{\text{iii}}$ (60 grammes).—M.

Pain in the eyeballs or at the back of the head is much relieved by an eye-douche of cold water playing three times a day for five minutes, against the closed eyelids. Irritability of the bladder is assuaged by the administration of alkalies with belladonna or hyoscyamus (p. 125.) Hemorrhage is combated with the means enumerated under menorrhagia (p. 108.) The chief resource, if milder measures fail, is curettage, which in some cases must be followed up by Apostoli's galvanocauterization, with the positive pole moved all over the inside of the body of the uterus.

In regard to amenorrhœa, the reader is referred to what has been said on p. 105. The most efficacious remedy is the galvanic current, with the negative pole in the uterus. Often the menses remain absent for several months after curettage, which gives the patient a wholesome rest after the previous loss of blood, and should not be interfered with.

The treatment of leucorrhœa is discussed on p. 112.

Curetting and cauterization do not only remove or destroy diseased tissue, but call forth a change in that which remains, the process of repair giving rise to the formation of countless medullary bodies, which are transformed to new histological form-elements.

Oppression, palpitation, sleeplessness, and nervous irritability call for the administration of bromides.

Cysts should be opened and painted with tincture of iodine. If there are many of them, it is well to destroy them with Paquelin's cautery; or it may be necessary to amputate the cervical portion. (See p. 221.)

Erosions should be bathed two or three times a week for five minutes through a speculum with a 10 per cent. solution of copper sulphate or treated with astringent applications or injections. In recalcitrant

cases the positive pole of the galvanic battery is very effective. A ball of gas carbons (Fig. 46, p. 51) wound with very little, slightly-moistened cotton is applied through a bivalve speculum to the eroded os for five minutes with as strong a current as the patient can support (about 40 milliamperes). It leaves an eschar followed by suppuration and healing. A similar treatment may be applied in the interior of the cervical canal with cylindrical electrodes (Fig. 47, p. 51).

If the cervix is torn, trachelorrhaphy should be performed; or, if the tissue is too cystic, the lips should be amputated. Both the cervix and the body may be painted with acids or astringents. If strong acids, such as carbolic, chromic, or nitric acid, are used, the application should be followed by ablution with a neutralizing solution of bicarbonate of soda. The most useful fluids for applications are tincture of iodine, and solutions of chloride of zinc, chloride of iron, ferrypyrin, or nitrate of silver (p. 56). Of late formalin, diluted with equal parts of water, has been recommended. It is both antiseptic and hæmostatic. It cauterizes the endometrium and is somewhat painful. The application of this substance may be repeated once a week or oftener.

Besides these applications, it is well to paint the vaginal vault with tincture of iodine. For an eroded os a tampon with glycerite of tannin is useful. Otherwise plain glycerin, or glycerin containing ichthyol or iodide of potassium, is preferable for wetting the pledget (p. 65).

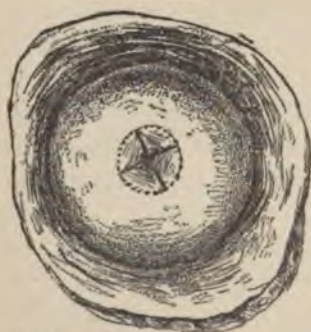


FIG. 181.
Excision of cervical endometrium.

After painting the vagina with tincture of iodine it is better not to insert a pledget with glycerin immediately, as this causes exosmosis, and we want endosmosis for the iodine. The patient may introduce the tampon later and change it morning and evening.

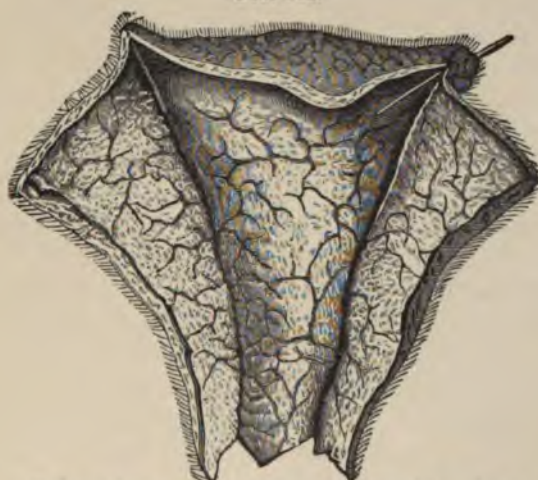
Scarification (p. 75) is used with excellent effect when the uterus appears congested.

If the external os and the cervical canal are too narrow to let the applicator pass, they should be dilated with coniform or expanding dilators (p. 34); and if the os is very contracted, it may even be necessary to make a small incision in it to make room for the smallest dilator.

In exceptionally stubborn cases of cervical endometritis the whole mucous membrane of the cervix may be cut out. This is done best by making a crucial incision and cutting out every quadrant separately (Fig. 181). During healing a glass stem should be kept in the cervix.

Exfoliating endometritis, menstrual endometritis, or membranous dysmenorrhœa is a rare disease which forms a link between acute and chronic endometritis. It is an acute inflammation of the endometrium that is repeated at each menstruation. The mucous membrane of the body is thrown off in shreds or in one piece representing a cast of the uterine cavity with its three normal openings (Fig. 182).

FIG. 182.



Endometrium cast off in menstrual endometritis. (Coste.)

This form of endometritis is found in women affected with syphilis, tuberculosis, or acute phosphorous poisoning, or who have myoma of the uterus. It is accompanied by severe pelvic pain at the menstrual period and followed by the expulsion of the endometrium. During pregnancy the process stops, to return after the puerperium. Often it leads to abortion.

The *diagnosis* is based upon the regular expulsion of membranes from the uterus at the menstrual period and microscopical examination of the dislodged tissue. This may be of three different kinds denoting intra-uterine pregnancy (abortion), ectopic gestation, or exfoliative endometritis:

	I. (FIG. 183.) MENSTRUAL DECIDUA (MEMBRANOUS DYSMEN- ORRHEA).	II. (FIG. 184.) INTRA-UTERINE PREG- NANCY (ABORTION).	III. (FIG. 185.) ECTOPIC GESTATION.
GLANDS.	Widely separated; have columnar epithelium.	Enlarged; have tendency to triangular shape; have flattened, cuboidal, or still lower epithelium.	Absent, because only the superficial layer, exclusively composed of cells, is thrown off.
SURFACE EPITHELIUM.	Columnar.	Becomes lower and finally disappears.	Flat as endothelium.
INTERGLANDULAR TISSUE.	The cells may be normal, small, and oval; or enlarged; or changed into giant cells or decidua cells.	The cells are considerably enlarged, especially in regard to protoplasm. They are polyhedral. The connective tissue disappears. There are few interspersed round cells. The diagnosis is doubtful, unless villi of the chorion are found.	The cells are somewhat enlarged, but much less than in intra-uterine pregnancy. They are oval.

Villi of the chorion are characterized by their dendritic shape, and are absolute proof of intra-uterine pregnancy.

Treatment.—The endometrium should be destroyed by curettage, followed by painting with tincture of iodine or the insertion of iodoform pencils, or by chemical galvanocauterization by Apostoli's method.

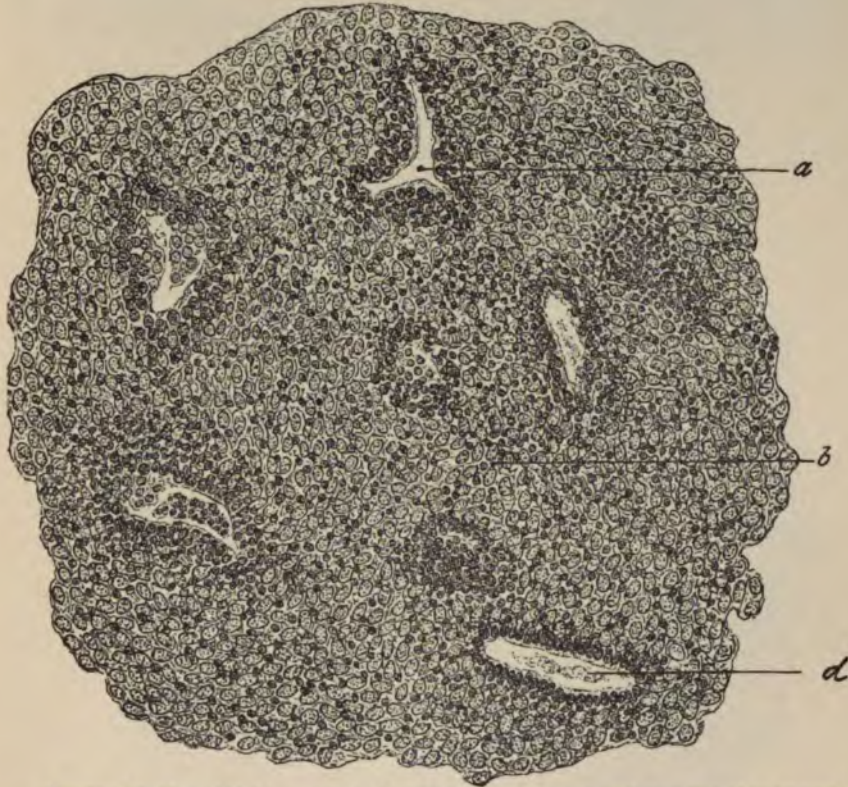
2. CHRONIC PARENCHYMATOUS METRITIS.—The uterus is enlarged, the cavity deeper, and the wall thicker. The muscular bundles are interspersed with much fibrous connective tissue (Fig. 186). The walls of the arteries are thickened and the lymph-vessels enlarged. In subinvolution, after childbirth or abortion, the muscle-fibres are increased in number and size. The endometrium is always inflamed.

Etiology.—A cold climate and a damp residence predispose to it, Chronic parenchymatous metritis may be due to extension from chronic endometritis, repeated attacks of acute metritis, too frequent or interrupted coition, childbirth, abortion, or displacements, especially retroflexion. It may accompany myomatous or cancerous uterine tumors or ovarian tumors.

Symptoms.—The patients usually complain of bearing-down, back-ache, pain in the iliac fossæ, headache, dysmenorrhœa, frequent menstruation, constipation, menorrhagia, and leucorrhœa. Mastodynia and swelling of the breasts occur often. As a rule, there is no fever, but occasionally a rise in the temperature to 102° F. bears witness to an intercurrent acute inflammation.

The growth of the uterus during pregnancy is accompanied by pain, and gestation often ends in abortion. Menstruation is usually painful, and sometimes a similar sensation, but of shorter duration, is felt in the middle between two menstrual periods—so-called *inter-*

FIG. 183.



Menstrual decidua. (Abel.) *a*, section of vessels surrounded by an agglomeration of small round cells; *b*, interglandular tissue composed of normal endometrium cells, with irregularly interspersed small round cells; *d*, section of a gland, somewhat enlarged with densely packed epithelial cells somewhat smaller than normal.

menstrual pain. By vaginal examination the uterus is found enlarged and sensitive and the os commonly also enlarged and granular.

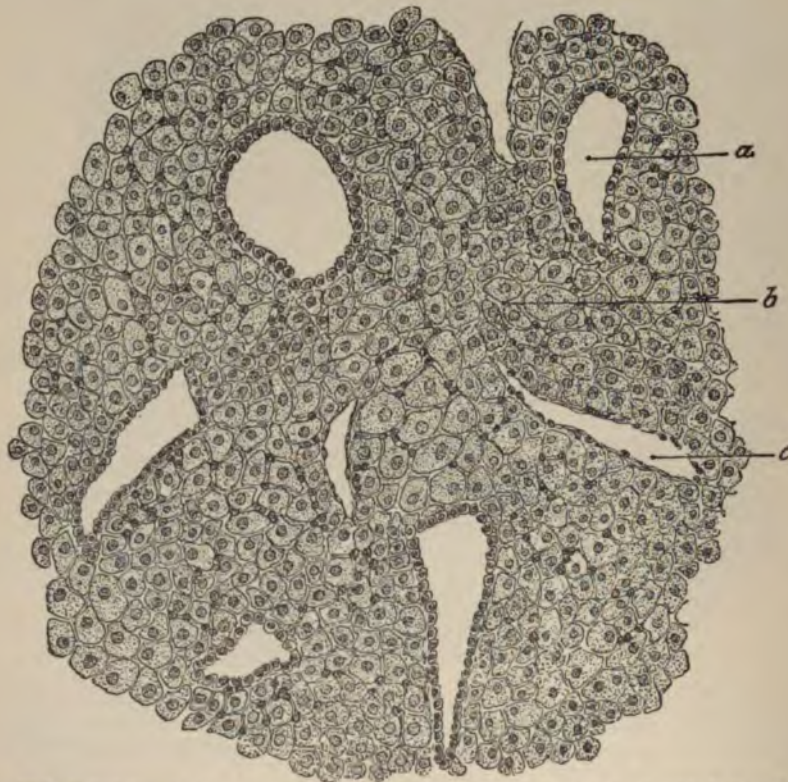
Diagnosis.—In cancer of the body a tumor can be felt. With the sound the surface may be felt uneven and some places unusually soft, while the whole organ is harder than in chronic metritis. There is a thin, purulent, malodorous discharge,—but that may be found in metritis and endometritis also.

Prognosis.—Chronic metritis rarely endangers life, but is a very protracted disease, hard to cure.

Treatment.—All that has been said about the treatment of chronic endometritis also applies to the parenchymatous inflammation, and besides the following should be noticed.

Chloride of gold or corrosive sublimate given internally for a long time may reduce the connective tissue. In subinvolution chlorate of

FIG. 184.

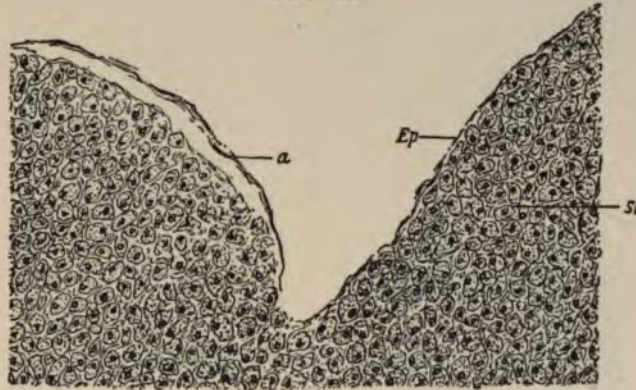


Decidua in intra-uterine pregnancy (abortion). (Abel.) *a*, section of gland with flattened epithelium; *b*, interglandular tissue composed of decidua cells, among which are interspersed here and there small round cells; *c*, section of vessel, on the wall of which are seen endothelial cells.

potassium, gr. vii ss (50 centigrammes) t.i.d., is recommended. The faradic current may reduce the bulk of the uterus by causing muscular contraction. The galvanic current obtains the same by electrolysis, and massage has a similar effect by mechanical manipulation. Often operative interference is required. Thus a torn cervix should be

repaired by trachelorrhaphy (Fig. 175, p. 206.) If the mucous membrane is very cystic, amputation with single flap (Fig. 187) is indicated.

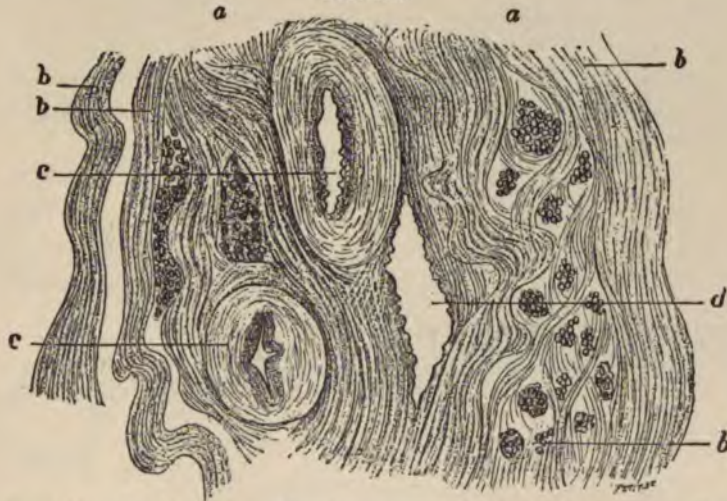
FIG. 185.



Uterine decidua expelled in a case of tubal pregnancy of two and a half months. *St*, stroma, consisting of enlarged cells; *Ep*, surface epithelium, changed to a pellicle like an endothelium, which at *a* has been separated from the underlying tissue in cutting.

Modus Operandi.—The patient is placed in the dorsal position, the vaginal portion is split in each side, for which Küchenmeister's scissors

FIG. 186.

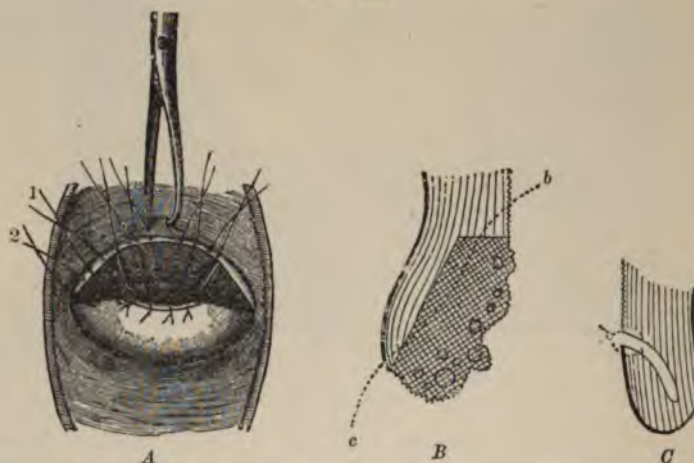


Chronic metritis. (Pozzi.) *aa*, muscular tissue traversed by bands of smooth connective tissue; *bb*, connective tissue; *c*, blood-vessels with thickened walls; *d*, lymph-space.

(Fig. 188) are very convenient. They have a probe-pointed blade, which is inserted into the cervix, and another ending in a little hook

that prevents the instrument from sliding back while cutting. Next, a transverse incision through the mucous membrane and part of the muscular tissue is made at the base of each lip. By a second incision

FIG. 187.



Amputation of the cervix by single-flap operation or excision of the mucous membrane (Schroeder.) *A*, the posterior lip is sutured, and sutures are passed through the anterior lip and the right lateral incisions (1, 2); *B*, a perpendicular section through one lip of the cervix shows the lines of incisions and the direction of the sutures *b*, *c*; *C*, section through the sutured flap.

the whole mucous membrane and some muscular tissue are cut away between the first incision and the os. Next, the flap is doubled up

FIG. 188.



Küchenmeister's scissors.

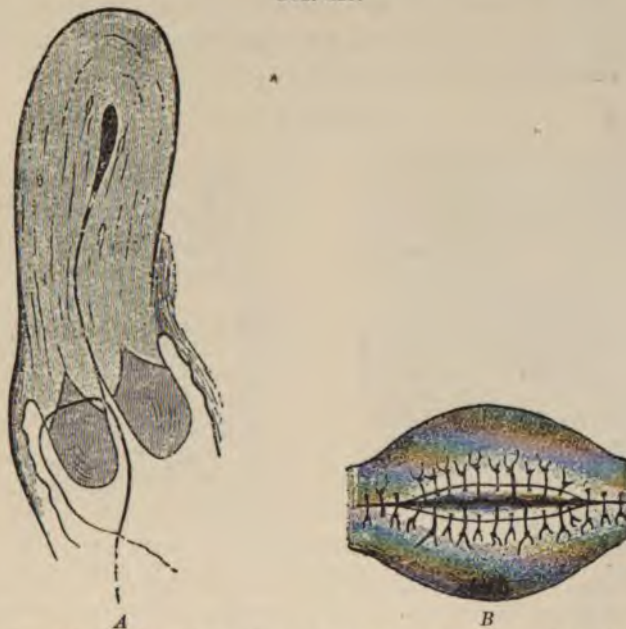
and sutured to the upper part of the cervix. Finally, the lips are united laterally.

If the mucous membrane is in a fair condition, but the cervix

much thickened, amputation with two flaps (Fig. 189) should be performed.

If the cervix is only elongated, the circular amputation (Fig. 190) is the best. Lateral incisions are made, as in the two preceding methods, and each lip cut off transversely with strongly-curved scissors. On the anterior lip the operator must be careful not to encroach upon the bladder, the boundary-line of which may be ascertained by introducing a sound into that organ. Next, sutures are

FIG. 189.



Amputation of the cervix with double flap, Simon's cone-mantle-shaped excision. *A*, a vertical section through the uterus, showing the lines of excision and way of passing the sutures; *B*, the cervix after closure of the sutures.

passed, skipping the middle part of the wounds. If the cervix is rather thick, better adaptation is obtained by using on the sides sutures that do not enter the cervical canal.

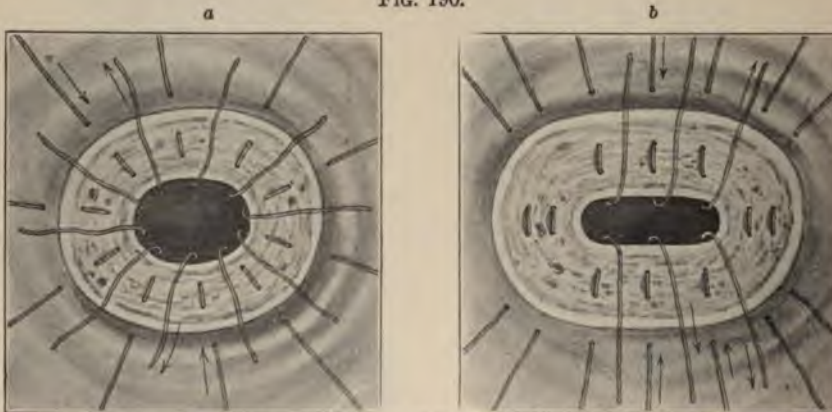
If the patient suffers from menorrhagia or leucorrhœa, the amputation should be preceded by curettage.

If the patient's life is threatened by loss of blood, oöphorectomy, which always entails atrophy of the uterus and nearly always cessation of menstruation, is indicated; or vaginal hysterectomy, leaving the ovaries and thus preserving their internal secretion, may be preferred.

§ 5. **Closure of the Uterus, or Acquired Atresia.**—The cervical canal may be closed at the external os, the internal os, or in its total extent. This may occur after childbirth or abortion or be due to cauterization with an actual cautery or strong chemicals. It may result from ulceration in scarlet fever, smallpox, or diphtheria. Or it may simply be due to old age, particularly in women suffering from prolapse of the uterus.

If the patient is still menstruating, the same symptoms will arise as in congenital closure of the genital canal (p. 165), and the uterus contains an accumulation of blood (*hematometra*), mucus (*hydrometra*), or pus (*pyometra*). If the fluid becomes decomposed and develops gases, the condition is called *physometra*.

FIG. 190.



Circular amputation of the vaginal portion of the uterus. (Hegar.) In *a*, two sutures on each side do not enter the cervical canal; in *b*, all sutures are passed from the vaginal to the cervical mucous membrane. In both cases a portion of the cut surface is skipped in passing the sutures.

If closure begins after the menopause, it hardly occasions any symptoms.

The size of the womb in acquired atresia rarely surpasses that of a fist. If the obstruction is at the external os, body and cervix blend into one globular mass. The disease takes a protracted course, and may end spontaneously when the expansion overcomes the obstruction.

Treatment.—The treatment is the same as for congenital atresia (p. 199).

§ 6. **Stenosis of the Cervix.**—Stenosis means narrowness. It is most common at the external os, less frequent at the internal, and may be found throughout the whole length of the cervix. It may be congenital or acquired. The causes of the latter are the same as for

atresia. The os may be so narrow that it does not even allow the passage of a uterine sound, and is then called a *pin-hole os*.

Often stenosis gives rise to no symptoms, except sterility, for a narrow cervical canal is a decided impediment to conception. In other cases the extravasated blood not finding a ready exit, the menstruation is painful—so-called *obstructive dysmenorrhœa*. This is particularly the case, if it coagulates, when the clots are expelled with cramps. Pent-up leucorrhœal discharge may have a similar effect. In some cases all the symptoms of chronic endometritis and parenchymatous metritis are developed.

Diagnosis.—The narrow external os may be felt by vaginal examination and seen with a speculum. The stenosis of the inner os is more difficult to prove. The normal isthmus is only $\frac{1}{8}$ inch wide and is distinctly felt as an elastic obstruction in passing the sound. But if this does not pass at all, while a thinner probe can be inserted, one may conclude that the canal is abnormally narrow. When the sound meets with an obstruction, it must be withdrawn and tried in other directions to ascertain that the end is not caught in a vallecule. The examiner should likewise by bimanual examination make sure that there is no flexion, and if there is one, give the instrument the proper curvature.

Treatment.—The cervical canal may be gradually dilated with coniform or expanding dilators to $\frac{1}{2}$ inch diameter in the office, or the patient may be anæsthetized and the dilatation carried to the full capacity of the instrument ($1\frac{1}{4}$ inches). This should be done slowly and in all directions, so as to avoid tears. The cervix should be loosely packed with iodoform gauze, for which later a glass stem is substituted. The patient should remain in bed for at least four days. Some prefer to cut the cervix in four directions with Simpson's metrotome, (Fig. 172, p. 203), and if the incisions are not made too deep and everything is clean, there is no objection to this. Otherwise there would be danger both of hemorrhage and sepsis.

§ 7. *Ulcers of the Cervix.*—The term ulcer is sometimes erroneously applied to erosions and granulations. But the cervix may be the seat also of true ulcers,—that is, an inflammatory process with molecular loss of substance,—such as chancroid, chancres, tubercular ulcers, simple ulcers, and corroding ulcers. The first three varieties have been described above (chancroid, p. 148; chancre, p. 149; tuberculous ulcer, pp. 138 and 187).

Simple ulceration is due to friction against the clothes when the cervix protrudes through the vulva, in consequence of hypertrophy

or prolapse (Fig. 156, p. 175). It is most frequently situated around the os. The surrounding tissue has a blue or purple color and is hardened. With proper care these ulcers heal readily. If the intravaginal cervix is hypertrophied, it is amputated with the ulcer. If the uterus is prolapsed, it should be replaced, a pledget smeared with iodoform and balsam of Peru ointment applied to the sore, and the whole retained with a perineal bandage. The ointment should be changed twice a day.

Corroding ulcer is rare. It is much like certain cancerous ulcers, but there is no new-formation of epithelial cells. The ulcer is due to calcification of the internal iliac artery. The diagnosis can be made only with the microscope, and the treatment consists in vaginal hysterectomy before a fistula forms. *Cancerous ulcers* will be described later.

• § 8. **Hypertrophy of the Uterus.**—This kind of enlargement is independent of inflammatory action. The size of the organ is increased, but the structure is normal. The augmentation may be *general* or *partial*. General hypertrophy is very rare. Partial hypertrophy does not often attack the body. Practically we have, therefore, to deal only with the change in the cervix. This may be *infravaginal* or *supravaginal*.

A. **INFRAVAGINAL HYPERTROPHY** takes place chiefly from above downward, and results in an *elongated cervix* (Fig. 191), the hypertrophic part being the vaginal portion, which normally should only be $\frac{1}{2}$ inch in length, but may increase so enormously as to protrude, penis-like from the vulva. This abnormal size may be congenital. The cervix is then only elongated, cylindrical, conical, or trunk-shaped. The os is small. The augmentation in size may be due also to childbirth, but then it is the result of chronic metritis and not a pure hypertrophy. In this latter variety the cervix is thick and the os large, and there is often prolapse of the vagina.

Symptoms.—Minor degrees of infravaginal hypertrophy hardly give rise to any symptoms. The increased weight may cause bearing-down. Friction between the elongated cervix and the vaginal wall may produce leucorrhœa. If the cervix protrudes, it is liable to become ulcerated. The enlarged vaginal portion may form an inconvenient obstruction during copulation, and the semen being ejaculated in the deep pouch behind the cervix, the spermatozooids do not so easily enter the os, in consequence of which the patient is liable to sterility.

The *diagnosis* is easy. Even if the cervix does not protrude, it is by vaginal examination found elongated. The vault of the vagina is normal. The fundus is felt at its normal place, but the sound enters from 3 to 6 inches.

Prognosis.—The abnormality is permanent. In virgins it is apt to tip the uterus backward into the displacement called retroversion.

Treatment.—Minor degrees may be successfully treated by dilatation. A more pronounced hypertrophy demands amputation by the circular or double-flap method (p. 223). If a considerable portion is to be removed, it is best, in order to avoid hemorrhage, to draw the cervix down, lay an elastic ligature provisionally around the base of the vaginal portion, and to prevent the constrictor from slipping to pass two steel pins across in front of it or fasten it in two opposite places with a silk suture.

B. SUPRAVAGINAL HYPERTROPHY (Fig. 156, p. 175) is situated in that portion of the cervix which lies above the uterovaginal junction. This is elongated and usually thinner than normal. The dimensions of the infravaginal portion of the cervix and of the body are not much increased. In its growth the cervix descends and draws the neighboring organs along. The vagina becomes inverted, and forms a tumor hanging between the thighs. In front, the hollow formed by the vault disappears, while behind there commonly remains a pouch, in which a malodorous smegma is secreted. In front of the protruding cervix lies the prolapsed bladder, behind is Douglas's pouch. The os is wide and often ulcerated. The uterine cavity is from 6 to 10 inches (15 to 25 centimetres) deep, nearly all of which increase falls on the supravaginal portion of the cervix.

Etiology.—It is the prolapse of the vagina that draws the cervix out like a piece of rubber, while the body remains in place. But, besides, circulation is impeded, the blood stagnates, new cells, new connective tissue, and new muscle-fibres are developed and render the increase in bulk possible. Everything that causes prolapse of the vagina thus indirectly leads to supravaginal hypertrophy, especially childbirth, laceration of the perineum, too early getting up in the

FIG. 191.



Hypertrophic elongation of the infravaginal portion of the cervix. A, cervix; B, C, anterior and posterior lips; D, roof of the vagina.

puerperium, subinvolution, venereal excesses, occupations that keep the patient much on her feet, and carrying of heavy burdens.

Symptoms.—The patient complains of bearing-down, backache, an uncomfortable sensation in the vagina, particularly in sitting down or getting up, leucorrhœa, frequent micturition, and constipation. Coition is unsatisfactory. By vaginal examination the peculiar finger-like shape of the cervix is felt in the middle of the prolapsed tissue. The body is felt in the normal height, often retro- or anteflexed. There is nearly always a bilateral laceration of the cervix, which participates in the inversion, so that the lips of the os are far apart. The epithelium of the vagina becomes horny and the mucous membrane is usually ulcerated.

FIG. 192.



Uterine and abdominal supporter.

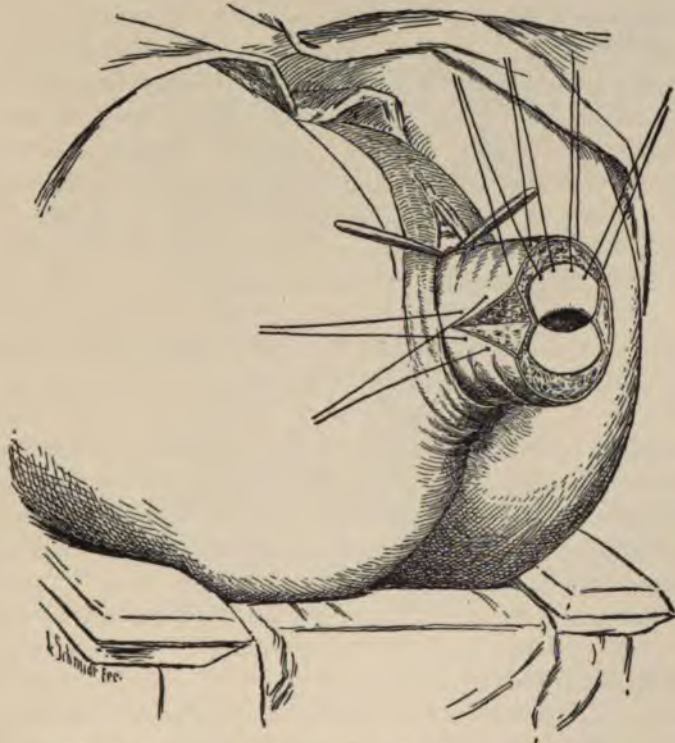
Diagnosis.—A *polypus* and an *inverted uterus* have no opening at the lower end. In *prolapse of the uterus* this organ is found in the prolapsed tumor, its cavity is not increased, and a finger in the rectum comes in contact with a catheter inserted in the bladder. In *infravaginal hypertrophy* there is no inversion of the vagina.

Prognosis.—The condition is never cured by nature's own efforts.

Treatment.—In the lesser degree the uterus may be elevated in strong anteflexion and kept up by an abdominal supporter with attached cup and stem pessary (Fig. 192), which should be removed at night, cleaned, and replaced before rising. If this does not give satisfaction, recourse must be had to an operation (Fig. 193). The patient is placed in dorsal position. After emptying the bladder and crowding the intestine up from Douglas's pouch, an elastic ligature is laid around the base of the inverted vagina and fastened in front and behind with silk sutures. A circular incision is made around the os and the vagina separated from the cervix, which is easily done with a knife, scissors, or even bluntly with the nails and closed scissors. Next, the cervix is divided bilaterally with Küchenmeister's scissors. An inch below the upper end of these lateral incisions a transverse one is made

through the mucous membrane of the cervix and the two flaps thus formed dissected back for $\frac{1}{2}$ inch. Next, the remainder of the cervix is cut transversely at the base of the flaps, which are stitched with three or four deep silkworm-gut sutures to the edge of the vagina. Then a triangular piece is cut out of the vaginal wall on either side, the base being about $\frac{1}{4}$ inch outside of the outermost sutures and the top at the constrictor. A couple of deep sutures are passed

FIG. 193.



Kaltenbach's supravaginal amputation of the hypertrophied cervix.

through the edges of the wound thus made and around the vessels on the side of the cervix. This excision allows one to exercise tighter compression of the vessels and affords an excellent adaptation between the vagina and the stump. Finally, the contact between the two mucous membranes of the cervix and the vagina is made perfect by a running catgut suture, and the constrictor is removed. If there is any bleeding, one or more deep lateral sutures are passed

into the stump. The operation leaves still some prolapse of the vagina, which may be disposed of by adding ventrifixation of the uterus, Lefort's prolapse operation, or Alexander's retroflexion operation, together with colpoperineorrhaphy; or vaginal or abdominal hysterectomy may be substituted. (See PROLAPSE, RETROFLEXION, and MYOMA.)

§ 9. *Acquired Atrophy; Superinvolution.*—We have seen above, under malformation, that the uterus may be congenitally too small (p. 200). But atrophy may also be acquired. It is normal after the menopause and it follows the extirpation of the ovaries.

There is likewise a *transient physiological puerperal atrophy*. The walls of the uterus become thin and flaccid, often the depth of the cavity is reduced from $1\frac{3}{4}$ to $2\frac{1}{2}$ inches. The cervix participates in this reduction, but not the ovaries. This atrophy lasts from the sixth to the tenth week of the puerperium and is most marked in those women who nurse their children. Exceptionally it may become *permanent*, and is then pathological. Sometimes menstruation may appear or a new pregnancy begin in the physiologically atrophic uterus.

In the non-*puerperal* variety the vaginal portion may disappear entirely, so that the vagina ends in a funnel, at the top of which the os is situated.

Permanent *puerperal atrophy*, or *superinvolution*, is a rare disease which occurs more frequently after abortion than after childbirth. It is caused by loss of blood, protracted lactation, debilitating diseases,—such as chlorosis, tuberculosis, syphilis, diabetes, Bright's disease,—or by exophthalmic goiter.

The non-*puerperal* variety may be due to pressure of a uterine fibroid or an ovarian cyst, to inflammation of the adnexa, or to operations on the uterus.

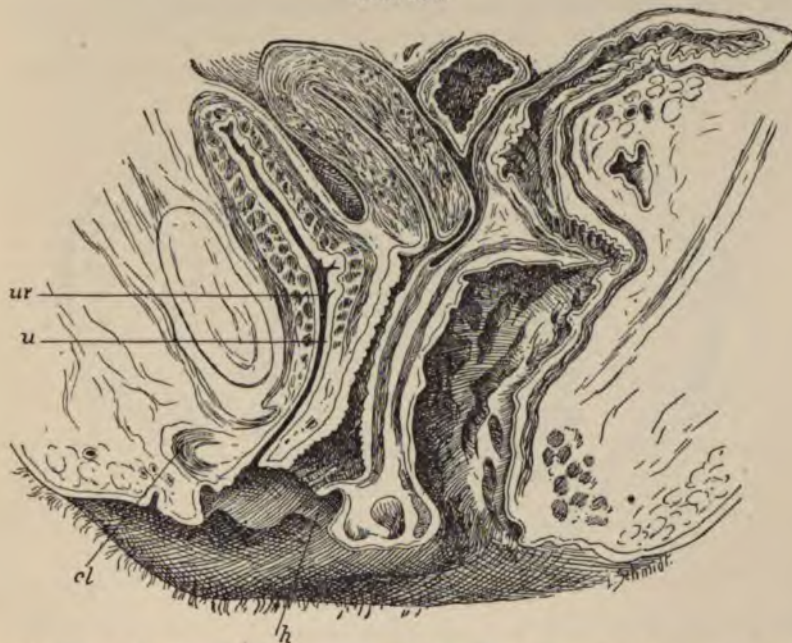
Senile atrophy does not give rise to symptoms, unless it is combined with atresia. Before the menopause the diminution in size leads to amenorrhœa and sterility. Some patients complain of sacral pain, headache, insomnia, mental depression, anorexia, indigestion, and general weakness. In the physiological form there is no disturbance in the health, and it serves perhaps as a preventive of subinvolution and chronic metritis.

Treatment.—Physiological *puerperal atrophy* calls for no treatment; but since it may become permanent, protracted lactation should be avoided, and at any time when the general health of the patient shows

sign of suffering from the drain on her constitution, it should be stopped. The non-puerperal acquired variety is treated like the congenital forms, with the negative pole of the galvanic current inside the uterus, tonics, and nutritious diet.

§ 10. **Gangrene.**—The uterus may become gangrenous in consequence of puerperal infection, under which circumstances the disease is fatal. On the other hand, gangrene attacking a myomatous or cancerous tumor or an inverted uterus may result in a cure.

FIG. 194.



Mesial section of the pelvis of a girl seventeen years old, half natural size. (Koelliker.) *ur*, ureter opening into bladder; *u*, vesical opening of urethra; *cl*, clitoris; *h*, hymen.

Treatment.—The patient's strength should be kept up with food, alcohol, and quinine, and the parts should be cleaned with frequent vaginal and intra-uterine antiseptic injections.

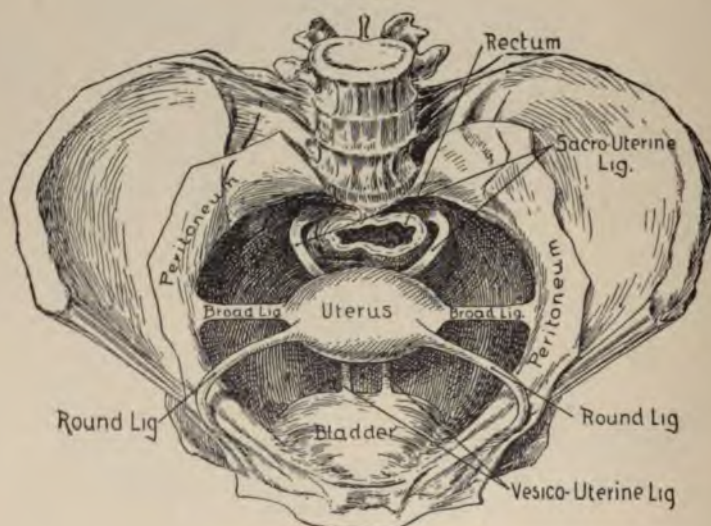
§ 11. **Hysteralgia, or Neuralgia of the Uterus.**—Neuralgia of the womb may be *idiopathic* or *symptomatic*. The idiopathic variety is rather rare. It is most frequent at the climacteric, less so at puberty. It may be due to anæmia, nervousness, hysteria, malaria, or rheumatism. The symptomatic form is common in chronic metritis, myoma, or cancer.

Uterine neuralgia is characterized by sudden attacks of severe pain in the uterus, which may irradiate to the sacral and lumbar regions, the iliac fossæ, or down the legs. These invasions may return at irregular or regular intervals.

Diagnosis.—The all-important task is to ascertain whether the condition is purely neurotic or grafted on an organic disease. If there is no malignant disease, the *prognosis* is good.

Treatment.—During the attack a hypodermic injection of morphine should be made. In the intervals the case should be treated according to its cause, with chalybeates, quinine, arsenic, or anti-rheumatics,—

FIG. 195.



The ligaments of the uterus.

such as alkalines, preparations of salicylic acid or iodine,—warm baths, the galvanic current, with the positive pole in the uterus, or the high-tension current.

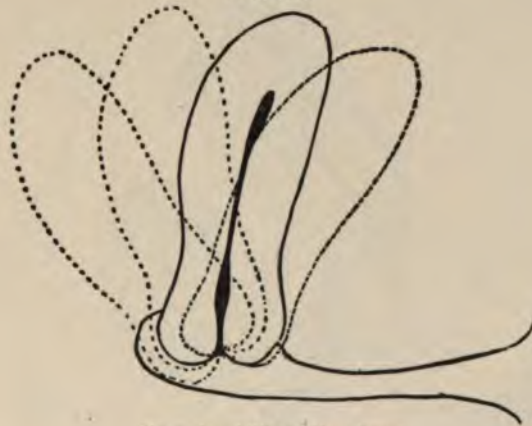
§ 12. Displacements.—There are five sources of information in regard to the normal shape and position of the uterus,—viz., dissection of dead bodies, section of frozen bodies, bimanual palpation of living women, laparotomies, and the development of the fœtus,—each of which modes of investigation contributes to our knowledge and corrects errors inherent in others. Thus, after death, the body lying on its back, the pelvic floor bulges out, and the uterus sinks too low and

too far back. The normal uterine cavity is straight, slightly curved forward (Fig. 194), or a little S-shaped (Fig. 164, p. 196).

The uterus is held in place by eight ligaments (Fig. 195),—the vesico-uterine in front, the sacro-uterine behind, the broad and round at the sides,—and is with its cervical portion inserted in the centre of the floor of the pelvis, like a stone in a ring; but the distribution of these restraining tissues is such that the uterus preserves considerable mobility. The excursions in part of a circle forward and backward are particularly free (Fig. 196), while the lateral movements and those up and down are much more limited.

The fundus reaches a little above the brim of the pelvis and lies slightly nearer to the right than to the left side. When the bladder

FIG. 196.



Normal mobility of the uterus.

and rectum are empty the uterus forms a right or obtuse angle with the vagina. A full bladder tilts it back and brings it nearer to the sacrum (Fig. 197), while an overloaded rectum tips it forward and approaches it to the symphysis pubis (Fig. 198). The small intestine is regularly found in the upper part of the recto-uterine excavation, not in the lower portion of the Douglas's pouch. It occupies also the vesico-uterine pouch if the bladder collapses in the shape of a Y, but not if it contracts by apposition of the anterior against the posterior wall, in which case the uterus and the bladder lie in contact (Fig. 194). During inspiration the fundus moves downward and forward, and the vaginal portion goes upward and backward. During expiration the organ performs the opposite excursions. During defecation and mic-

turition it sinks; by coition it is elevated. The uterus is, then, a very movable organ; but certain changes in shape and position are relatively permanent and are called displacements. These are *anteversion*, *anteflexion*, *retroversion*, *retroflexion*, *lateroversion*, *lateroflexion*, *anteponition*, *retroponition*, *lateroposition*, *prolapsus*, *elevation*, *inversion*, and *hernia*.

Anteponition, retroponition, and lateroposition, if not due to pressure from a tumor, are developmental abnormalities of merely anatomical interest.

A. ANTEVERSION.—Anteversion (Fig. 199) is that displacement in which the fundus uteri points forward or even downward, the cervix

FIG. 197.



Uterus displaced by full bladder. (Mundé.)

backward or upward. In other words, the uterus lies horizontally or slants downward with its fundus. The axis is unchanged. The condition is due to parenchymatous metritis or subinvolution, by which the weight of the organ is increased; to perimetric adhesions, that draw the fundus out of place; to deficient development of the vaginal portion or its operative removal, by which the influence of the vagina on the direction of the uterus is lost.

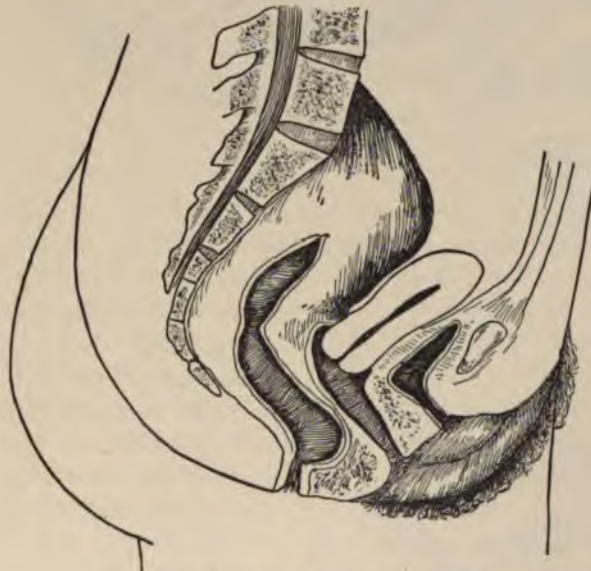
The symptoms are those of chronic endometritis and parenchymatous metritis, especially frequent micturition, dysmenorrhœa, menorrhagia, leucorrhœa, and sterility. If there are no adhesions, a feeling of discomfort is produced by the rolling of the large, heavy, and stiff uterus.

Diagnosis.—By bimanual examination the uterus is felt in its abnormal position and the os is not within the easy reach characteristic of its normal position.

Prognosis.—Anteversion does not threaten life, but is hard to cure.

Treatment.—The treatment is chiefly directed against the inflammation. Secondly, the uterus may be raised and kept in place by pes-

FIG. 198.



Uterus displaced by full rectum. (Mundé.)

saries, especially Thomas's anteversion pessary (Fig. 200), or Gehrung's double horseshoe-shaped pessary (Fig. 201); but if, as sometimes happens, the uterus bends over the pessary, so that the version is changed into a flexion, the condition is made worse, and the instrument should be discarded. Thomas's is in most cases the best, probably because it raises the whole uterus and thereby frees the circulation.

GENERAL REMARKS ON PESSARIES.—Pessaries are instruments by

which the uterus is supported or given a special direction. They are used very much less now than formerly, operations having taken their

FIG. 199.



Anteverted uterus.

place. Personally, the writer has discarded them, except Emmet's in cases of retroflexion or retroversion, if operation is refused; or a

FIG. 200.



J. TIEMANN & CO.

Thomas's anteversion pessary. *A*, lower end resting just inside of the vaginal entrance; *B*, upper end to be introduced into the posterior pouch of the fornix; *C*, anterior movable bow, which is to lift the uterus from the anterior portion of the vaginal vault.

glass stem inserted during the process of healing after incisions in the cervix. All vaginal pessaries cause some irritation, and may, if neglected, burrow deep into the tissues. The smallest instrument that will do the work should be chosen. It ought to be inspected a few days after having been inserted, to ascertain that it fits well and does not gnaw. The patient should use daily cleansing vaginal injections, and the pessary should be examined at least once in two months.

If it irritates the mucous membrane of the vagina, it must be left out for a week, during which antiseptic douches are prescribed. If it becomes rough, it must be renewed. Pessaries are made of different material, such as whalebone, steel springs, or copper wire covered with soft

rubber, hard rubber, block tin, or aluminium. They have also a great variety of shapes, generally as rings or ovoid bodies. Some are solid, others inflatable. Soft rubber, and in some patients hard rubber, in contact with the vaginal secretions gives rise to an unpleasant odor.

Elastic rings acquire their power by eccentric pressure against the wall of the upper part of the vagina. Others, like the above-mentioned of Thomas, press against the muscles and fasciæ surrounding the entrance to the vagina. Gehrung's takes its support on the anterior and the posterior walls of the vagina.

Pessaries are introduced while the patient occupies the dorsal or left lateral position. In antedisplacements the former, in retrodisplacements the latter, is preferable. The uterus should first be given the right shape and position with the fingers or sound. The instrument should be made slippery with a suitable lubricant. Soft rubber is corroded by oil, but lubrichondrin can be used for any pessary.

Thomas's pessary with movable front bow is introduced, closed behind the cervix, and then withdrawn sufficiently to allow one to separate the movable bow and place it in front of the cervix. Finally, the whole instrument is pushed up till it rests on the vaginal vault behind and in front.

Gehrung's pessary is placed with the upper horseshoe turned down on a table, the connecting bows pointing forward against the physician, who seizes the one nearest to his right hand and inserts the other as far as it goes into the right side of the vagina. Next, he makes the end he holds slip into the left side, and, finally, he turns the whole instrument on a horizontal axis, the result of which manœuvre will be that the two horseshoes rest against the uterus and the connecting bows point backward. In withdrawing the pessary, the movements are gone through in the opposite order.

An abdominal supporter (Fig. 87, p. 78) may be useful in taking weight away and steadying a large, movable uterus. The latter is done still more effectively by a solid pad applied over the symphysis (Fig. 88, p. 78). If the cervix is thick, it ought to be amputated by the double-flap method, which may reduce even the body of the uterus in size.

FIG. 201.



B. ANTEFLEXION.—Anteflexion is that displacement of the uterus in which it forms a more or less strong curve or even an angle opening forward. The top of the curvature or the angle corresponds generally to the internal os. Anteflexion is *corporeal* (Fig. 202) when the body dips down while the cervix has the normal direction; *cervical* (Fig. 203) when the cervix is turned forward, the body being normal; or *cervicocorporeal* when both body and cervix are bent forward. The flexion may form an obtuse, a right, or an acute angle, which has been designated as the first, second, and third degree. In the very highest degree fundus and cervix come in contact with each other, being separated only by the vaginal wall. Anteflexion may be *congenital* or

FIG. 202.



Corporeal anteflexion.

acquired. In the congenital the anterior lip is sometimes so deficient that the os is situated on the anterior surface instead of at the end.

The uterus may be entirely normal, except in shape, but commonly it is in a condition of chronic metritis. At the angle is often found fatty degeneration, atrophy, or cicatricial tissue. The sacro-uterine ligaments are sometimes swollen and shortened. The cervix is frequently elongated and coniform. The fundus may be bound to the anterior wall of the pelvis by adhesions, or similar formations may implicate the tubes and ovaries. The anteflexed uterus may at the same time be anteverted or retroverted (Fig. 204).

Etiology.—The congenital variety is due to an arrest of development. The acquired is produced by inflammation of the womb or its

surroundings, especially cellulitis of the sacro-uterine ligaments,—so-called parametritis posterior,—constipation, masturbation, or exposure during menstruation. It may derive from subinvolution, pressure from an abdominal tumor, the presence of a myoma in the anterior wall of the uterus, or general weakness.

Symptoms.—Some patients with an anteфлекed uterus enjoy perfect health and consult the physician only for sterility, which is a common feature. Others have marked dysmenorrhœa. Young girls with the congenital form have sometimes amenorrhœa. There is often pelvic pain or divers reflex neuroses, especially headache, gastralgia, backache,

FIG. 203.



Cervical anteфлекion. (Mundé.)

intercostal neuralgia, or asthenopia. The patient generally complains of leucorrhœa and frequent micturition.

Diagnosis.—The shape of the uterus is felt by bimanual examination. If in stout women it is difficult to ascertain, the patient should be turned on her left side, when the concavity of the uterus falls right over the examining finger. In *anteversion* the uterus is straight and the os points backward; in anteфлекion the axis is bent or broken and the os central or turned forward. The presence of a *myoma* in the anterior wall may be established by introducing a sound and comparing the thickness of the anterior and the posterior wall. In

parametritis posterior one or both sacro-uterine ligaments are felt through the vagina or rectum, extending from the angle between the cervix and the corpus to the sacrum, as swollen, sensitive cords.

Pregnancy.—An anteverted uterus will never become straight, but the degree of flexion may be diminished and the symptoms disappear, especially if pregnancy occurs, which is often the result of treatment.

Treatment.—This is partly dynamic and partly mechanical. The inflammation is combated with hot douches, glycerin tampons, painting with tincture of iodine, scarification, and curetting. The flexion

FIG. 204.



Antelexion combined with retroversion. (Mundé.)

may be diminished by introducing a sound bent like the uterus, straightening it gradually, and reversing it, with the concavity backward. In regard to the mode of overcoming difficulties in entering, the reader is referred to what is said on p. 32. Dilatation not only widens the cervical canal, but at the same time straightens the uterine cavity. During recontraction it is well to let the patient wear an intra-uterine glass stem, kept in place by a retroflexion pessary, with a little cup in which the stem moves freely (Fig. 205). The stem should have a silk thread attached, by which it can easily be pulled out at

any time. It is introduced with the fingers or a dressing-forceps. But a patient with a stem pessary in her uterus should be constantly watched.¹ In irreducible cases of ante flexion the posterior lip may be split in the following way :

Discission of the Posterior Lip.—The patient is placed in the dorsal position, with elevated feet. The cervix is exposed with Garrigues's weight speculum and pulled down with a bullet-forceps applied to the right side of the canal. As a rule, there will be indication for curetting the uterus. The posterior lip is cut with Küchenmeister's scissors in the median line to the uterovaginal junction, and the incision continued with Simpson's metrotome through the internal

os, until it admits the tip of the little finger (Fig. 206). Next, another

FIG. 206.



Sagittal section through ante flexed uterus. *a*, vagina; *b*, uterus; *c*, base of first incision; *d*, base of second incision.

bullet-forceps is fastened to the left flap of the cervix and the edges of the wound in the vaginal portion united with a running suture of chromicized catgut (Fig. 207). A glass stem should be left in the uterus during healing. If there is considerable elongation of the cervix, the end may be amputated before applying the suture. By this operation the os is moved back, the canal straightened, and the internal os widened.

If there is any hemorrhage, which has not happened to

the author, the uterus should be packed with iodoform gauze instead of the glass stem, and the vagina too.

If the symptoms are referable to the appendages, it may be necessary to operate on them also.

C. RETROVERSION.—Retroversion (Fig. 208) is that displacement of the uterus in which the whole organ is turned on its transverse axis,

¹ Garrigues, "Danger of Stem Pessaries," Amer. Jour. Obst., xii., No. 4, p. 756, October, 1879.

FIG. 205.



Thomas's cup and stem pessary.

so that the fundus points backward, or even somewhat downward, the os forward, or even somewhat upward. The longitudinal axis is unbroken. It is generally only a transition to retroflexion and by far not so common, or the two conditions are combined, which is termed *retroversionioflexion*. We have seen above that retroversion may be combined also with antelexion.

FIG. 207.



Suturing the edges of the first incision. *a*, vagina; *b*, cut surface; *c*, anterior wall of cervical canal; *d*, os externum; *e*, running suture of chromicized catgut uniting the edges of the first incision.

inflamed. Frequently the uterus is bound to the rectum with adhesions. It is generally enlarged, situated low in the pelvis, the cervix is thick, and the os wide. The circulation in the pelvis is more or less obstructed by the twisting of the broad ligaments.

Etiology.—Retroflexion may be congenital. It may be due to an elongated cervix or too little depth of the posterior pouch of the vaginal vault. As a rule, it is acquired. It may result from too protracted rest in bed after delivery or from retention of a portion of the placenta on the anterior wall, which grows larger than the posterior and bends it backward, or from the overstretching and weakening of the round and broad ligaments. It may be produced by frequent overdistention of the bladder. Normally the uterus is so situated that its posterior surface is at the same time the upper; and the pressure of the abdominal organs, far from tending to expel it in the upright posture, secures it in its position. But if in any way the long axis of

The *diagnosis* is made by bimanual examination and, if necessary, the sound.

The *treatment* is the same as for retroflexion.

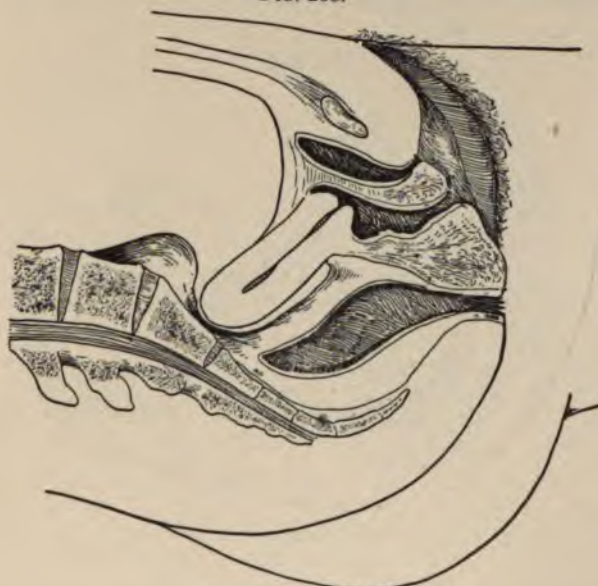
D. RETROFLEXION.—In retroflexion the fundus uteri is displaced backward and usually more or less downward. The longitudinal axis is bent backward. The os is in normal position, points downward and backward (Fig. 209). But frequently the retroflexion is combined with retroversion, when the os is directed downward and forward (Fig. 210).

As a rule, the uterus is in a state of chronic inflammation, and often also the appendages are in-

the uterus falls behind a perpendicular line through the os, the same force will tilt the organ more and more backward and bend it so that the anterior surface points upward. Another cause is perimetric inflammation with the formation of adhesions that draw the body of the uterus and the broad ligaments towards the rectum and the posterior wall of the pelvis.

Symptoms.—Unlike antelexion, retroflexion in most cases entails suffering. Few patients of this class feel well. Generally they complain of the symptoms of metritis,—pain, dysmenorrhœa, menor-

FIG. 208.



Retroversion. (Mundé.)

rhagia, metrorrhagia, leucorrhœa, dyspareunia, and dysuria. Constipation, due to the mechanical obstruction created by the pressure of the fundus against the rectum, digestive troubles, malnutrition, and nervousness are common. On the other hand, retroflexion does not interfere so much with conception as antelexion; the low position, the wide os, and the direction of the cervical canal as a continuation of the axis of the vagina rather favor the entrance of the fertilizing elements.

Diagnosis.—A *myoma* in the posterior wall of the uterus (Fig. 211) may fill Douglas's pouch like a retroflexed uterus, but by bimanual examination the body of the uterus is felt extending forward; or, if

necessary, this direction is proved by inserting a sound. An *exudation* or a *sarcoma* in Douglas's pouch may give rise to a similar error, which is avoided in the same way. Some uteri are so flabby that they move as if there were a hinge between the cervix and the corpus, and one day they are found retroflexed and another anteфлекed.

A point of great practical importance is to ascertain whether there are adhesions or the uterus is freely movable. By placing the patient in the genupectoral position and introducing a finger into the rectum, adhesions to this organ are felt as tense bands. If she lies in Sims's position and a sound is introduced into the uterus, this may, if there are no adhesions, be brought into its normal place and will remain

FIG. 209.



Retroflexion of the uterus.

there; but if the uterus is adherent, it can either not be moved forward at all or returns immediately to the abnormal position. Sometimes it is possible under anæsthesia to replace a uterus that before seemed adherent and keep it in normal relations to the other pelvic organs.

Treatment.—The aim must be to combat inflammation and replace and retain the uterus in a better position. The first indication is met by hot douches, tampons, painting with tincture of iodine, scarification, curetting and drainage, and resolvers given by the mouth. The second is satisfied in many different ways: air-pressure, bimanual replacement, digital pressure, repositors, pessaries, and operations.

Air-pressure.—In rare cases it suffices to place the patient in the

knee-chest position and open the vagina with a Sims speculum, when the intruding air together with the negative abdominal pressure may replace the organ.

Bimanual Replacement (Fig. 212).—Another method that has a very limited application is to place the patient in dorsal position with drawn-up knees, introduce one or two fingers into the posterior cul-de-sac of the vagina, and press the fundus upward, and with the other hand press down the abdominal wall above the symphysis and try to

FIG. 210.



Retroversionflexion. (Mundé.)

seize the fundus and draw it forward. This can be done only in very thin women with a relaxed abdomen.

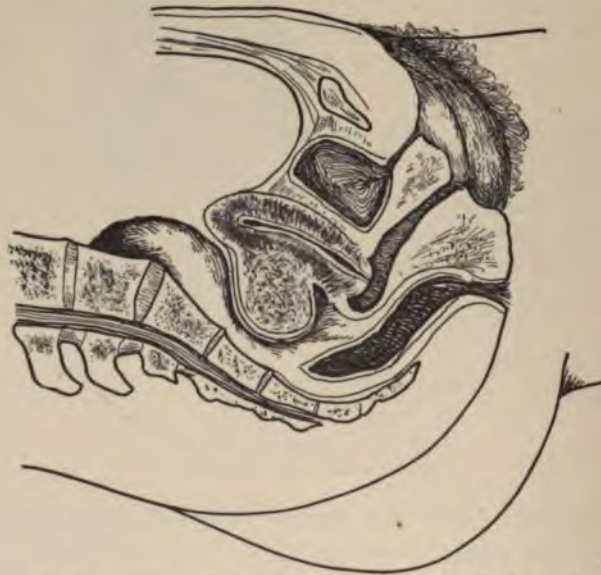
Digital pressure is a good method that can be used in many cases. The patient is placed in Sims's position, the index- and middle fingers are inserted with the volar side turned against the posterior wall of the vagina and pressed up against the uterus (Fig 213), choosing the direction of one of the corners of the pelvic brim, where there is more space than at the promontory. When the fundus yields, the effect is enhanced by applying the fingers against the anterior wall of the cervix and moving it backward (Fig. 214).

Repositors.—If the two fingers behind the uterus are not long enough, they may be replaced by a cotton tampon held in a pair of

forceps. Often it is, however, necessary to use the uterine sound as a repositor, which is done in the following way. The patient is laid in Sims's position. The sound is introduced, with the concavity backward, until it reaches the fundus. Next, the handle is made to describe a large semicircle, while the knob remains on the same point in the cavity. When the concavity points upward and forward, the handle is gently moved back until the knob points towards the umbilicus, but no force must be used; if a resistance is felt or the procedure is painful, the surgeon should desist from carrying the reposition any farther.

Pessaries.—When the uterus is replaced, it should be retained in its normal position, which is done by pessaries or various operations.

FIG. 211.



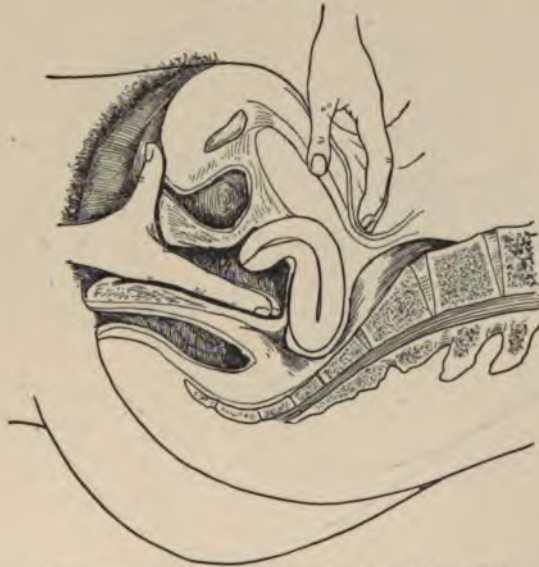
Myoma in the posterior wall of the uterus simulating retroflexion. (Mundé.)

Pessaries are a poor makeshift and are used much less nowadays than formerly; but there are always patients who from some cause or another cannot be operated on and who are much benefited by wearing a pessary permanently or temporarily. The pessaries used for this purpose are modifications of Hodge's pessary. Emmet's (Fig. 215) is an oblong, S-shaped ring with a wider upper and a narrower lower end. Albert Smith's pessary (Fig. 216) differs from the former by being more curved and more pointed at the lower end. Thomas's has the same

curvature as Emmet's, the same lower end as Smith's, but is much thickened at the upper end (Fig. 217). The lower end in all is bent backward, to avoid pressure on the urethra.

All these pessaries are made of hard rubber. The general remarks made above (p. 235) on pessaries apply also to them. They are introduced in the following way. The patient is placed in Sims's position and the uterus replaced. The pessary is seized by its lower end and lubricated except where it is held. It is introduced in the sagittal plane, pressing the perineum well back. When the pessary has passed with its greatest width, it is turned into the coronal plane and held with the left thumb and index-finger, while the right index is applied inside the

FIG. 212.



Bimanual replacement of retroflexed uterus. (Mundé.)

upper end, and by a combined movement of both hands the pessary is placed around the cervix (Fig. 218), and finally the lower end is moved well back with the right index-finger, insuring an adaptation of the upper end to the uterus, as high as possible. Beginners are apt to place the pessary in front of the cervix; but by following the rules given here they will be able to avoid this mistake. The pessary should fit as snugly as a shoe. It should reach from the deepest point of the vagina to its entrance and exert as uniform a pressure as possible. For this purpose it is often necessary to modify its shape,

which can be done by smearing it with oil and passing it through the flame of an alcohol lamp, when it becomes so soft that it can be bent into any shape.

If the hard pessary touches an inflamed ovary, the pain may be intolerable. Then one made of whalebone, covered with soft rubber, may be substituted to advantage.

In some patients the uterus will remain in place after having been supported for from three to six months, but most of them are obliged to wear the pessary permanently. They should avoid lying on their backs, and must sleep extended on their stomachs or in a lateral,

FIG. 213.



Digital reposition of retroflexed uterus. First step. (Mundé.)

semiprone position. The pessary treatment may be still more aided, if the patient, on retiring, will take the knee-chest position for a few minutes, letting the air into her vagina either with a finger or a glass tube.

OPERATIONS.—Whenever possible, retroversion and retroflexion should be operated on. It is better, because more in conformity with nature to shorten the elongated round ligaments than to fasten the body of the uterus to the vagina or the abdominal wall. This shortening may be done at the external inguinal ring, in the vagina, or in the abdominal cavity. But, before performing any special retroflexion

operation, the uterus should be curetted for the never-failing chronic endometritis; and the commonly present laceration of the cervix should be repaired by trachelorrhaphy. If the perineum is torn, it should be closed by colpoperineorrhaphy.

1. *Extraperitoneal Shortening of the Round Ligaments (Alexander's Operation).*—This should be the operation of choice, but it is contraindicated if the uterus is held back by adhesions, or in old women in whom the ligaments become atrophic.

Modus Operandi.—The pubic hair is shaved off and skin and vagina disinfected. The uterus is replaced and a glass stem with

FIG. 214.



Digital reposition of retroflexed uterus. Second step. (Mundé.)

attached silk thread introduced into its cavity. A narrow Hodge pessary is placed in the vagina. Next, the patient's legs are extended. The operator stands on the side opposite to the ligament to be shortened; he locates the pubic spine, which is the leading landmark during the whole operation, and makes an incision from 1 to 3 inches in length through the skin over it, in the direction of the slit between the pillars of the external inguinal ring. Its length must be proportionate to the amount of adipose tissue present, but it should, if possible, not extend beyond the hairy portion of the mons Veneris,

as then, after the hairs grow out again, the cicatrices will be entirely hidden. Next, the subcutaneous fat and the superficial fascia are divided in the same direction, exposing the glittering, satin-like pillars of the external ring, which is situated above and a little outward of the

FIG. 215.



T. A. Emmet's retroflexion pessary.

FIG. 216.



Albert Smith's retroflexion pessary.

spine of the pubis and can be felt at the bottom of the wound. It is well to dissect the aponeurosis of the external obliquus abdominis muscle, so as to see not only the pillars, but the intercolumnar fascia extending between them. During the incision several small arteries will be severed and must be clamped.

In the external inguinal ring is seen a lump of fat which contains the ligament. This whole mass is grasped with an artery-forceps and drawn in the direction of the vulva. The genital branch of

FIG. 217.



T. G. Thomas's retroflexion pessary.

the lumbocrural nerve is seen as a fine white cord in front or to one side of the ligament. If it is in the way, it may be cut, but generally it suffices to push it aside. From the ligament extend a number of sinewy threads to the sides of the inguinal canal, which must be severed. Sometimes the peritoneum is invaginated and forms around the

ligament a sheath, which must be stripped back with the nails of the fingers. When the isolated white tendinous ligament peels readily out from the canal, the wound is covered with iodoform gauze or sterile gauze; the operator takes his position on the other side and treats the second ligament in the same way. Before fastening the ligaments he should pull both forward and ascertain, through the abdominal wall or the vagina, that the uterus is tilted forward. He should then slacken them from $\frac{1}{4}$ to $\frac{1}{2}$ inch, in order to avoid undue strain on them and the formation of a hernia. They are

fastened by passing three sutures of chromicized catgut through them and both pillars on each side, the last one comprising some of the tendinous tissue in front of the pubic bone.

When the sutures have been tied, the superfluous piece of the ligament, which will measure from 2 to 4 inches, is cut off. The superficial fascia is closed with a running suture of plain catgut, and finally the skin wound is closed with two or three sutures of silkworm gut. The two wounds are dressed with one piece of iodoform gauze, gutta-percha tissue, and plain gauze, kept in place by a double spica or

FIG. 218.



Retroflexion pessary in place. (Mundé.)

straps of rubber adhesive plaster. At the end of a week the superficial sutures are removed. The patient should remain in bed three weeks. Then the intra-uterine pessary is removed, but that in the vagina should be worn for nine weeks or longer. If Alexander's operation is combined with trachelorrhaphy or perineorrhaphy, the vaginal pessary is not introduced before the patient gets up.

If the use of the intra-uterine stem is neglected, the operator may inadvertently change a moderate retroflexion into one more pronounced (Fig. 219), which is impossible when the stem is in the

cavity (Fig. 220). If the ligament breaks or cannot be found, the anterior wall of the inguinal canal must be split open. If even then they are not found, they should be attacked from the vagina or the abdominal cavity.

FIG. 219.



Diagram showing the effect of pulling on the round ligaments without previously straightening the uterus. *a*, uterine end of round ligament. The arrows indicate the direction of the force.

Nobody should presume to perform this operation without having practised it on the cadaver. No muscular tissue should at any time

become visible; if it does, the operator has gone too deep or in a wrong direction.

FIG. 220.



Diagram showing the effect of pulling on the ligaments when there is a stem in the cavity. *a*, uterine end of round ligament.

2. *Shortening of the Round Ligaments from the Vagina* (Wertheim-Goff's operation); *Anterior Colpotomy*.—The uterus is dragged down with a volsella. A transverse incision is made on the anterior wall of the vagina, about an inch above the end of the cervical portion. By blunt dissection the bladder is separated from the cervix to the peritoneum. The edge of the transverse incision is seized near the median line with two pairs of bullet-forceps, and while the anterior wall of the vagina is put on the stretch, a second incision is made at right angles to the first and extending from its middle to the base of the urethra. The

incision divides the vaginal wall. Next, the vaginal flaps are dissected from the bladder, 1-1½ inches on each side. The peritoneal fold

between this organ and the uterus is then opened and torn freely by lateral pressure with the two index-fingers. A finger is hooked over the fundus uteri, and this organ, with appendages, drawn into the vagina. The round ligament is grasped with a compression-forceps, at a point as far out from the corner of the uterus as can be brought in contact with the origin of the ligament,—that is, from $2\frac{1}{2}$ to 3 inches. Next, a fine silk suture is passed through the ligament at a point midway between the forceps and this starting-point and through another point situated at the same distance outside of the forceps. When this suture has been tightened, another fastens the point held by the forceps to the root of the ligament, which thus is folded twice. Additional sutures may be passed through the three layers of ligament, in order to unite them more securely and diminish the strain on the first ones. The ligament on the other side is treated in the same way, the uterus replaced into the pelvic cavity, and the wound closed with chromicized catgut.

If the appendages are diseased, they may be submitted to conservative treatment or removed, as the case may call for.

3. *Shortening of the Round Ligaments from the Abdominal Cavity.*—Fig. 221 shows the normal course of the ligament. Laparotomy having been performed (see ABDOMINAL HYSTERECTOMY), the round ligament may be fastened to the anterior abdominal wall with three sutures on either side (Olshausen), or folded and stitched together with a single loop turned outward (Wylie), or inward (Palmer Dudley, Fig. 222), or a double one (Mann), as in the vaginal operation.

Since every laparotomy contains an element of danger to life, even if nowadays it is small, it is hardly justifiable to perform it for an uncomplicated retroflexion; but if the appendages are diseased and the abdomen is opened to treat them, the retroflexion may at the same time be relieved by shortening the round ligaments.

Adhesions.—If the fundus uteri is bound down by adhesions, they may sometimes be brought to absorption by *massage* or *packing*. If not, they may, perhaps, be severed by *posterior colpotomy*. The patient is in dorsal position with drawn-up knees. Garrigues's weight speculum is inserted, a transverse incision is made behind the uterus, at the uterovaginal junction, and the tissues are separated bluntly till the peritoneum is reached. This is seized with two pairs of Kocher forceps and divided transversely with scissors. After severing the adhesions, the edges of the peritoneum are reunited with a running catgut suture and then the vaginal wound closed in the same way and the

uterus fastened by Alexander's operation. If there are too extensive adhesions or the severance causes uncontrollable hemorrhage, laparotomy should be performed. Most adhesions can be separated with the fingers, others must be tied with two ligatures and cut or severed with thermocautery or galvanocautery.

4. *Ventrifization, Suspension of the Uterus.*—The uterus may be fastened in different ways. A method much used is Kelly's suspension. An incision 3 or 4 inches long is made in the median line of the abdomen, about $1\frac{1}{2}$ inches above the symphysis pubis. The uterus is

FIG. 221.



Transverse section through the body, showing the normal position of the pelvic organs. (Savage.)

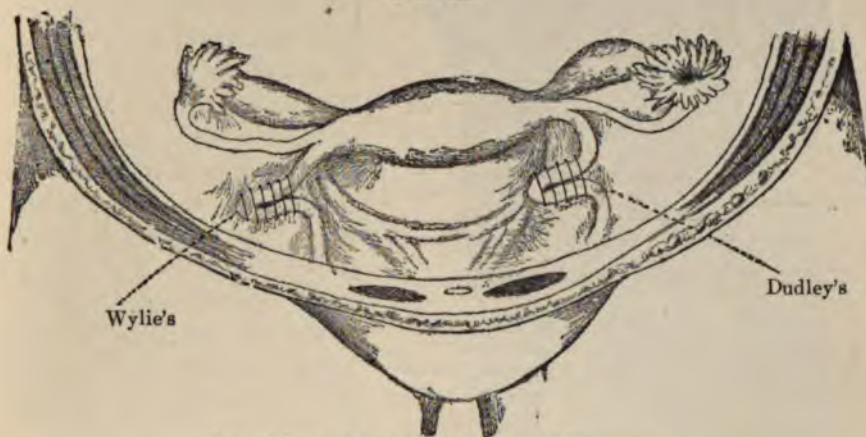
lifted and a suture passed $\frac{1}{8}$ inch deep through the abdominal wall, the posterior wall of the uterus, and the other side of the abdominal wall. When this is tied, another suture is passed parallel to it above the first on the abdominal wall and below on the uterus. Adhesions form at once, but stretch, so that the uterus separates from the abdominal wall and remains in an easy ante flexion. But from the abdominal wall to the uterus extends a pseudo-ligament, which more than once has led to ileus and death.

In whatever way the retroflexion is operated on, a pessary should be worn in the vagina for several months.

E. LATEROVERSION AND LATEROFLEXION.—Lateral deviations of the uterus may be congenital or acquired by adhesions, tumors, etc., which may be operated on.

F. PROLAPSE.—We have seen above (p. 175) that in consequence of prolapse of the vagina there may be hypertrophy of the supra-vaginal portion of the cervix (p. 227) and protrusion of these parts through the vulva. But there may be also a prolapse of the whole uterus. This may in rare cases be *acute*,—that is to say, that in a healthy woman, carrying a considerable weight, for instance, a tub full of water, in front of her, the womb suddenly slips out of the body,

FIG. 222.



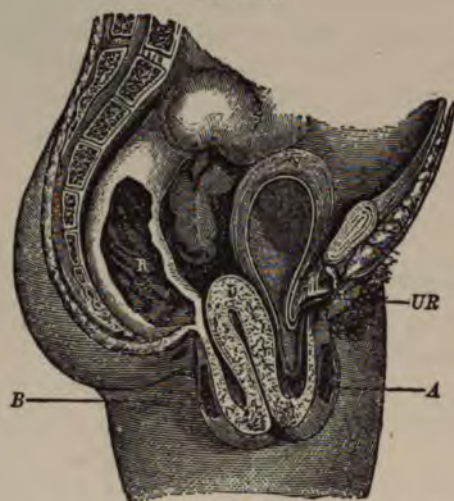
Intra-abdominal shortening of the round ligaments.

inverting the vagina. Ordinarily it is *chronic*. It may be *incomplete*, which condition is also called *descensus*, when the uterus remains in the pelvis; or *complete*, which is also termed *procidentia*, and is characterized by the extrusion of the uterus into the inverted vagina, which hangs below the vulva. The vagina undergoes exactly the same changes as to dryness and hardness of the epithelium and ulceration which we have mentioned in connection with general prolapse of the vagina, the only difference being that there is no marked elongation of the cervix and that the body of the uterus is found in the prolapsed part (Fig. 223).

Etiology.—Chronic prolapse is nearly always due to childbirth. During pregnancy the vulva, the vagina, the uterine ligaments, and

the pelvic connective tissue become infiltrated with serum. During labor these same organs are subjected to great distention, contusion, and laceration. After the birth of the child, the uterus often remains too large and heavy, in consequence of subinvolution. When the fasciæ and muscles of the pelvic floor, which contribute to its support, are injured, too great a burden is thrown on the ligaments that sus-

FIG. 223.



Procidentia, or complete prolapse of the uterus, with surfaces pared for Lefort's operation. (Leblond.) A, anterior denudation; B, posterior denudation; U, fundus uteri; UR, meatus urinarius; R, rectum.

tain it from above, and they are weakened and elongated. As soon as retroversioflexion is established, the intra-abdominal pressure contributes to the displacement. During the lying-in period, when all the tissues are soft, succulent, and yielding, the very weight of the urine accumulating in the bladder is likely to start a cystocele. Thus lack of support from below and above combines with weight, pressure, and dragging to displace the uterus after confinement. More rarely the prolapse is due to a tumor in the uterus, which increases its weight,

or an abdominal tumor, that crowds it down.

The *symptoms* of chronic prolapse are the same as in supravaginal hypertrophy (p. 228). The acute form is characterized by sudden pain in the abdomen, faintness, and peritonitis.

Diagnosis.—Like supravaginal hypertrophy, it differs from *polypus* and *inversion* by the presence of the os at the lower end of the tumor, and from *supravaginal hypertrophy* it is distinguished by the low position of the fundus and the normal or only slightly increased depth of the cavity.

Treatment.—The *preventive* treatment consists in good obstetrics, rest after delivery, the treatment of retroversion and retroflexion, and the timely repair of lacerations of the perineum. If there is any ulceration and the uterus can be saved, the ulcer should be treated as stated above (p. 226). A large ring pessary may keep the prolapse in.

(Fig. 224.) Common pessaries are of little use, because they do not find the necessary support from below. The abdominal supporter with vaginal stem and cup (Fig. 192, p. 228) may do some good. But the proper treatment is surgical. As a preparation for the operative measures the patient should replace the uterus, and keep it back with a bandage, and occupy the knee-chest position for some time every day, and use hot vaginal injections, whereby the never-failing edema of the uterus is much reduced. Most operations aim at restoration of the suspension from above and support from below. In young women this is done best by combining shortening of the round ligaments, especially Alexander's operation, with colpoperineorrhaphy. In old women, *Lefort's operation* (Figs. 223, 225), combined with perineorrhaphy, gives good results.

Modus Operandi.—A denudation $\frac{3}{4}$ inch wide and over 2 inches long is made on the anterior and the posterior walls, close up to the vulva. The tumor is replaced sufficiently to bring the upper ends of the pared surfaces in contact and stitch them together with chromicized catgut. One such row is placed over the other until the whole wounds are united, forming a solid column in the middle of the vagina. Finally, the posterior part of the vulva is denuded and united from side to side with silkworm-gut sutures, as in colpoperineorrhaphy.

Another operation much performed after the climacteric is the *vaginal fixation* of Mackenrodt. The beginning is like that for retroflexion by the Wertheim-Goff method (p. 252): An incision is made in the median line of the vagina from near the meatus urinarius to the uterovaginal junction. The

FIG. 224.



Ring pessary for prolapsus (inflated rubber).

FIG. 225.



Lefort's prolapsus operation. A, anterior denudation; B, posterior denudation; C C', upper right lateral sutures; D D', upper left lateral sutures.

flaps are dissected from the bladder. A catheter is introduced to ascertain the boundary between this organ and the uterus. The posterior wall of it is separated, cutting some tough strands with scissors, but mostly with the forefingers boring in the loose connective tissue, till the peritoneum is reached. This is seized with two pairs of Kocher forceps and incised longitudinally. Next, the cervix is pushed up and back with a bullet-forceps. Similar forceps with long prongs or sutures are inserted in the anterior wall of the uterus, one pair over the other, until the fundus is reached. Then this is seized and drawn down to the urethral end of the vaginal incision. The redundant portion of the vaginal flaps are cut off with scissors, and the fundus uteri scraped with a scalpel. A silkworm suture is passed through the urethral end of one flap, the fundus uteri, and the corresponding point of the other flap. This is tied and similar ones placed higher up, closing the whole incision and fastening it to the anterior surface of the uterus, while the bladder remains above. The effect is that the uterus cannot even be pulled down with a forceps grasping the cervix. Finally, the perineum is repaired. The same operation may be performed for cystocele or retroflexion after the menopause.

In rare cases, in which other methods have failed, the uterus is diseased, and the patient is beyond the child-bearing age, the uterus may be removed by vaginal hysterectomy, but a considerable portion of the vagina must be cut off at the same time in order to prevent prolapse of the organ.

Vaginal Hysterectomy and Resection of the Vagina (Fritsch).—The patient is placed in breach-back position. The uterus is curetted and disinfected. Each lip of the os is seized with a Péan traction-forceps and drawn well upward and forward (Fig. 226). Between the middle and upper third—that nearest the vulva—an angular incision is made, the top of which lies in the median line and the ends on the sides of the vagina. This penetrates the whole wall of this organ, and is deepened bluntly with the finger-nails and closed scissors till the peritoneum of Douglas's pouch becomes visible. That membrane is seized with two pairs of Kocher forceps and cut transversely between them with scissors. The posterior edge is stitched to the posterior wall of the vagina, and a pad with attached silk thread is inserted into the opening in front, to keep back the intestine. Next, the uterus is drawn as far down and backward as possible, and a similar incision made on the anterior wall of the vagina (Fig. 227), joining the first at the sides, but much shallower than that, so as not to wound the

bladder. If there is a large cystocele, this incision is extended above, near to the urethral mound. The triangular flap is separated bluntly and with the knife from the bladder. A transverse incision is made just below this organ, which is separated from the uterus, till the peritoneum of the vesico-uterine pouch appears. This is incised transversely and the anterior flap secured with a silk thread. The uterus

FIG. 226



Vaginal hysterectomy for prolapsed uterus, posterior incision.

is then retroflexed and pulled out. The broad ligaments are tied off in portions from the upper border to the point where the incisions meet on the side of the cervix. This is done with Schroeder's half-sharp needle (Fig. 73, p. 71) and catgut. Each portion is cut loose from the uterus as soon as tied. If the ovaries are healthy and the patient young, they should be left, but in those passed the

menopause it is better to remove them together with the uterus. When this is extracted, the edges of the anterior incision are reunited by a running catgut suture, the stumps of the broad ligaments are fastened in the vagina, the peritoneum of the bladder is stitched to the anterior circumference of the vagina, and the opening in the vagina packed with iodoform gauze.

FIG. 227.



Vaginal hysterectomy for prolapsed uterus, anterior incision.

G. ELEVATION.—The uterus may ascend by its own size, no longer finding room in the pelvis, or be drawn up by contracting adhesions.

H. INVERSION.—Inversion is the displacement in which the uterus is turned inside out. It may be *partial* or *total*. It may be divided into three degrees. In the first there is only an indentation of the fundus, the inverted part being retained in the uterus (Fig. 228); in

the second, the partially inverted uterus lies in the vagina (Fig. 229); in the third, the totally inverted uterus is prolapsed and hangs between the thighs (Fig. 230).

Etiology.—Inversion is commonly due to childbirth,¹ but is fortunately very rare, especially since the placenta is removed by pressure on the uterus and not by pulling on the cord, as was done formerly. Parturition in the erect posture and a lacerated cervix predispose to it. But it may occur at the time of getting up from an entirely normal childbed. A portion of the fundus becomes paralyzed and sinks down, while the surrounding musculature contracts above it. Exceptionally, the inversion begins at the cervix and extends upward.

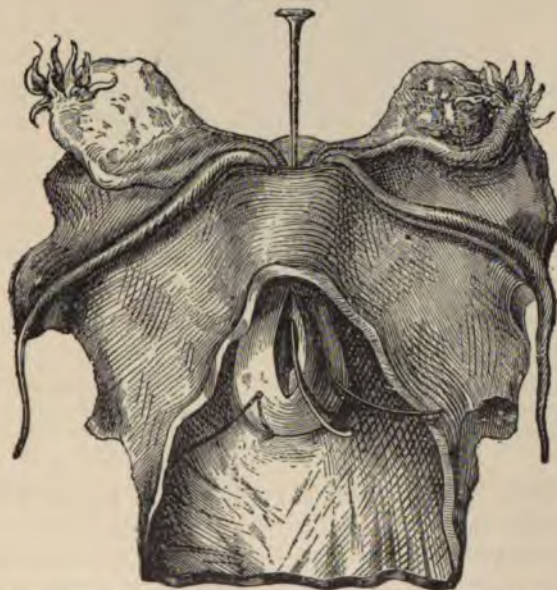
The inversion may be caused also by a tumor at the fundus which, forming a polypus, is expelled and drags the uterus

FIG. 228.



Inversion of the uterus, first degree. (Mundé.)

FIG. 229.



Inversion of the uterus, second degree. (Denucé.) The tubes and round ligaments are drawn into the inverted uterus, through which is passed a sound, and bristles have been inserted into the uterine openings of the Fallopian tubes.

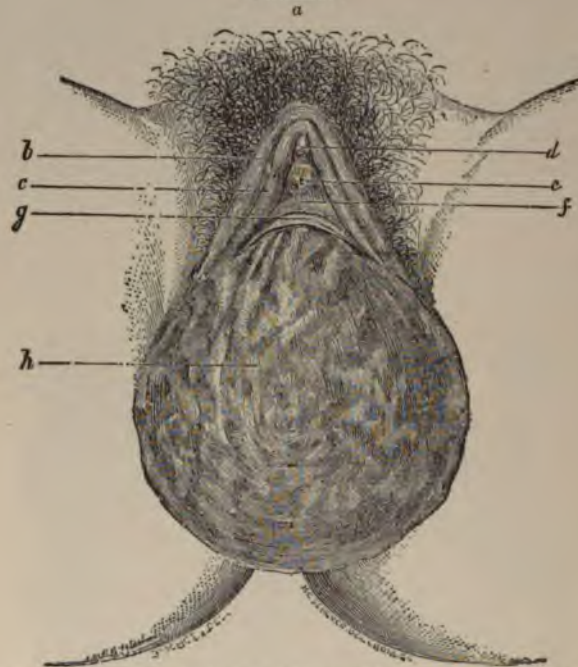
along. It has likewise been observed independently of pregnancy and tumor when the uterus was large and soft.

¹ Garrigues, "Obstetrics," 1902, p. 517.

Pathological Anatomy.—When the inverted part is retained in the uterus, it is covered by a dark-red, swollen mucous membrane, prone to bleeding. If it lies in the vagina, it often loses its glands, and its surface becomes like that of the vagina. If it protrudes from the body, it is frequently ulcerated or covered with cicatrices.

The inverted uterus forms a pouch lined with peritoneum, into which are drawn parts of the round ligaments and the tubes and some-

FIG. 230.



Complete inversion of the uterus. (Boivin and Dugès.) a, mons Veneris; b, labium majus; c, labium minus; d, clitoris; e, meatus urinarius; f, vagina; g, os externum; h, the mucous membrane of the uterus.

times the ovaries. The peritoneal surfaces may adhere to each other or their contents, so that the cavity becomes closed.

Symptoms.—When the inversion takes place suddenly it is usually accompanied by pain, hemorrhage, and collapse; but exceptionally all alarming symptoms may be absent, and the condition is found only by abdominal palpation and vaginal examination. In the subacute and chronic forms, hemorrhage is the chief symptom, which undermines the constitution and may even become fatal.

Diagnosis.—The distinction from *prolapse* or *hypertrophy of the cer-*

viz is easy by the presence of the os uteri at the lower end of the tumor in these conditions. But that from a *polypus* may be quite difficult, if the tumor is enclosed in the uterus. The funnel shape of the fundus and the diminished depth of the cavity are, however, characteristic for inversion. If the inversion goes farther, the tumor can be felt in the vagina, and by careful search the uterine openings of the tubes may be seen. A polypus attached to the cervix (Fig. 231) may fill the vagina, but its attachment can be made out with the sound, the uterine cavity has its normal depth, and the fundus its normal form.

In stout women it may be difficult or impossible to palpate the uterus through the abdominal wall. Then information as to its presence and shape may be obtained by inserting the index deep into the rectum and a stiff catheter or male sound into the bladder. If there still remains any doubt, it is even justifiable to dilate the urethra till the other index can be introduced through it.

If the uterus has been drawn down by a myoma, it is necessary to distinguish the latter from the former. The fibroid is usually harder, often nodulated, and a needle plunged into its tissue causes less pain than when it passes through the uterine wall. If a polypus becomes adherent to the cervix, the sound cannot enter, but the fundus retains its normal shape and position.

If the inverted uterus is prolapsed, it may be possible to find the ostia of the tubes.

Prognosis.—Inversion is a dangerous condition; but the gynecological—*i.e.*, the older—is much less fatal than the obstetrical, or recent, variety. Very rarely the inversion goes back spontaneously. Sometimes the inverted part may slough off; and, if the patient does not die of septicæmia, the gangrene may result in a cure, with the loss of the uterus. The disease calls, therefore, for immediate and active interference.

Treatment.—In regard to the treatment of inversion during labor or in the puerperium, the reader is referred to works on obstetrics. Here we have to deal only with subacute or chronic inversion, as they come under observation weeks, months, or years after their formation.

First, reposition should be attempted with *Aveling's repositor* (Fig. 232). The vagina is disinfected and the apparatus applied without anæsthesia. The instrument consists of a cap of vulcanite, about $1\frac{1}{2}$ inches in diameter, and an S-shaped, metal rod which protrudes

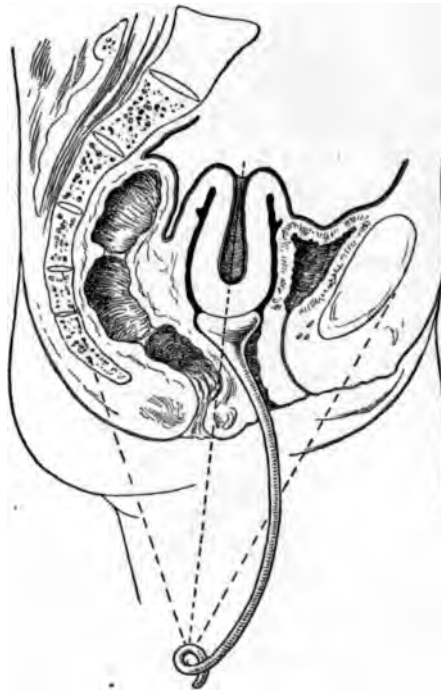
FIG. 231.



Cervical polypus
simulating inversion. (Mundé.)

from the vulva. To the lower end are attached four tapes with rubber rings. The abdomen is covered with a binder, which is steadied with braces going over the shoulders and fastened to it with safety-pins. Two of the tapes are brought forward and two backward and tied to the safety-pins so as to exert pressure in the direction of the pelvic axis. A moderate pressure— $2\frac{1}{2}$ pounds—suffices to cause the reinversion of the uterus in from nine to fifty-four hours by starting an antiperistaltic movement. The part forming the pedicle

FIG. 232.



Aveling's repositor.

is replaced first and the fundus last. During the treatment the patient remains in bed, and, if necessary, pain is relieved by hypodermic administration of morphine.

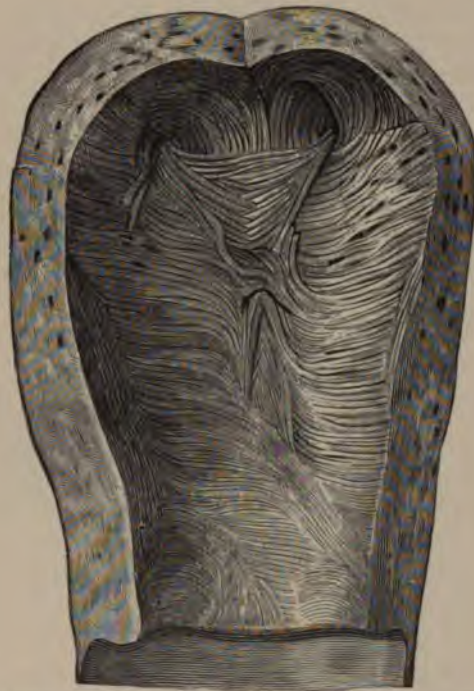
If this method does not succeed, which is very rare, *manual reposition* should be tried by one or all of the following methods. *Noeggerath's method* is based on the distribution of the muscular fibres around the horns of the uterus (Fig. 233). The thumb and the middle finger are placed on the ostia uterina of the Fallopian tubes

and counterpressure made through the abdominal wall on the funnel-shaped depression. First one horn is replaced, then the other, and finally the body and fundus.

Courty's Method.—He introduced two fingers of the left hand into the rectum and pressed with them on the peritoneal funnel, while the fingers of the right hand pressed on the base (pedicle) of the tumor in the vagina.

If the urethra has been dilated for diagnostic purposes, *Tate's method* may be employed (Fig. 234). He dilated the urethra and

FIG. 233.



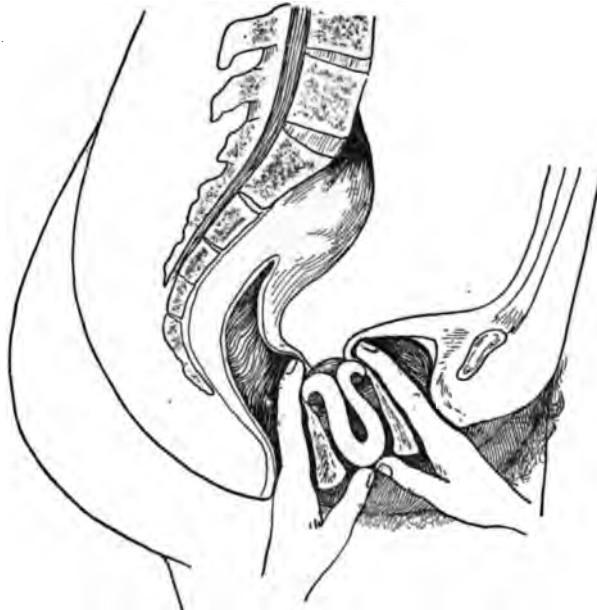
The submucous muscular layer of the pregnant uterus. (Hélie.)

inserted the right index into the bladder, the left into the rectum, and placed both thumbs on the fundus. By simultaneously stretching the cervix and pressing on the fundus the organ was reinverted.

If partial replacement is obtained, *T. A. Emmet's method* of closing the lips of the os over the inverted uterus with sutures deserves imitation, since thereby an elastic pressure is exercised by which complete reinversion may be obtained.

Conservative Cutting Operation.—Küstner performs posterior colpotomy, introduces the left index into the pedicle, and tries reposition. If this does not succeed, he makes an incision in the median line of the posterior wall of the inverted uterus, when it can be replaced without difficulty; or if there is still resistance, the canal may be dilated with olive-shaped and expanding dilators. Next, the uterus is brought into retroflexion and drawn through the incision in the vagina. The wound in it is closed with a running suture of catgut, the organ replaced, and the vaginal wound closed.

FIG. 234.



Tate's method of reducing an inverted uterus.

Amputation.—If all conservative efforts fail, the uterus must be sacrificed. This may be done by amputating it with the galvanocautic wire or the thermocautery. If it is done with knife and scissors, silver sutures should beforehand be passed through the base, three in the middle and one on either side, by which the lateral vessels are controlled, whereas the inner serve to unite the lips of the pedicle. The chief danger in amputation is that a knuckle of intestine may have been drawn into the inverted uterus.

Destruction of the Mucous Membrane.—In women near the climac-

teric this danger may be avoided and perhaps a cure effected by destroying the mucous membrane of the uterus with thermocautery, galvanocautery, or potassa cum calce.

If the inversion is due to a *fibroid*, an incision should be made over the latter, and it should be *enucleated* with Thomas's spoon-saw (Fig.

FIG. 235.



Thomas's spoon-saw.

235). Redundant tissue is cut off and the edges united by suture. Next, the uterus is reinverted and packed with iodoform gauze.

If the tumor is *malignant*, the uterus should be removed by vaginal or abdominal *hysterectomy*.

I. HERNIA UTERI, or HYSTEROCELE.—Under Malformations (p. 202) we have mentioned that the uterus, in extremely rare cases, may be found in an inguinal or crural hernia. The condition is nearly always congenital.

§ 13. Neoplasms.—A. CYSTS.—We have above mentioned the small *cervical cysts* called ovula of Naboth, and others (pp. 210, 215, 221). *Cysts of the corpus* are very rare, but they may be multiple. They originate probably in the bottom of a utricular gland, which is separated from the remainder, or in Gartner's canal. They are chiefly of anatomical interest.

B. ADENOMA; MUCOUS POLYPI; MYXOMA.—Adenoma is a new-formation arising in the utricular glands. There is a *benign* and a *malignant* variety. To the benign belong those growths we have met in speaking of hyperplastic endometritis (p. 211). They may be sessile or pedunculated, in which latter case they are called *mucous polypi*, or, if composed of glands, *glandular polypi*. Such tumors are frequently attached to the mucous membrane of the cervix and hang out from the os (Fig. 177, p. 210). Similar polypi may be constituted of *myxomatous* tissue with few or no glands.

Some adenomas form tumors composed nearly exclusively of uterine glands, while the cells in the stroma become rare and the connective tissue extremely scanty. As long as the epithelial lining is unbroken and the single glands separated from one another, the affection is benign.

Malignant adenoma is only the first stage of carcinoma. The gland spaces are much enlarged and irregular, and frequently break

through into other gland spaces. The columnar cells of the glands are often changed to cuboidal or squamous ones. These epithelial cells frequently fill up a gland space, but never penetrate the stroma between the glands. The neoplasm extends to the muscular tissue, which it destroys by causing atrophy.

Placental polypi are pedunculated tumors, developed by layers of fibrin being deposited on remnants of the placenta which remain in the uterus after childbirth or abortion. Rarely the nucleus consists alone of decidua, when the tumor is called a *decidual* or *fibrinous* polypus.

Symptoms.—Adenomas and mucous polypi cause hemorrhage, leucorrhœa, and sometimes pelvic pain and backache. A polypus situated above the internal os may act as a ball-valve and produce severe dysmenorrhœa.

Treatment.—The growths are removed from the interior of the womb with the curette and the endometritis treated as described above. Polypi hanging out from the os are taken away by torsion, an *écraseur*, the galvanocautic wire, or the thermocautery. If they are simply cut off with scissors, the cautery should be kept ready to control hemorrhage. In malignant adenoma the uterus should be extirpated by vaginal hysterectomy, the diagnosis having been established by microscopic examination of scrapings obtained by curettage.

C. MYOMA, OR FIBROID; FIBROID POLYPUS; FIBROCYST.—Myomas, or fibroids, of the uterus are tumors composed chiefly of muscle-fibres, interspersed with more or less connective tissue, which mixture is designated by the terms *fibromyoma* when the muscular tissue predominates, and *myofibroma* if the larger portion is fibrous connective tissue.

Pathological Anatomy.—Uterine myomas are a common disease. They form globular tumors composed of several nodules, and may become as heavy as the whole rest of the body. As a rule, they are harder than the normal uterus, but may be so soft that they give the sensation of fluctuation. The cut surface is white or pinkish, bulges out over the surrounding tissue, and shows a concentric arrangement of the fibres. Often the tumor is surrounded by a layer of loose connective tissue, the so-called *capsule*. As a rule, the substance is compact and dense, and contains less fluid than the uterine wall, but in some cases it may be full of dilated arteries, veins, and lymph-vessels, when it is called *cavernous myoma*, *myoma teleangiectodes*, or *myoma lymphangiectodes*. Nerves enter the interior of the tumor. Commonly the musculature of the uterus becomes hypertrophic, but sometimes it

nearly disappears, and the uterus is then a conglomeration of myomas held together with sparse connective tissue (Fig. 236). Myomas may be *single* or *multiple*, *cervical* or *corporeal*. Those of the body are much more common than those in the cervix. They may be *sessile* or *pedunculate*. Those that have a pedicle may hang out from the cervix and develop in the vagina or be enclosed in the cavity of the uterus or protrude in the peritoneal cavity. Pedicillate myomas covered with mucous membrane are called *fibrous polypi*. The mucous membrane may, how-

FIG. 236.



Uterus in which all muscular tissue was replaced by myomas and connective tissue. *a*, resected vaginal flaps; *b*, hypertrophic supravaginal cervix; *c*, body of uterus full of fibroids, although nine were enucleated before it could be drawn into the vagina; *d*, vaginal portion. (From an operation by the author.)

ever, become atrophic, and the naked tumor protrude from its muscular bed (Fig. 237).

FIG. 237.



Myoma partially embedded, partially protruding through the mucous membrane. Smooth lower end free. (From an operation by the author.)

ever, become atrophic, and the naked tumor protrude from its muscular bed (Fig. 237).

Myomas are termed *submucous* (Fig. 238) if they develop directly under the mucous membrane; *subperitoneal* (Fig. 239) if they are situated immediately under the peritoneum; and *interstitial*, or *intramural* (Fig. 240), if the tumor is surrounded on all sides by a layer of

muscular tissue. Often the tumors developing in different directions give the uterus an appearance like certain cactuses (Fig. 241).



Fig. 238. Pedunculated submucous fibrous tumor (fibroid polypus) enclosed in uterus. *F*, fundus of uterus; *O O*, ovaries; *IL*, infundibulopelvic ligaments; *RL*, round ligaments; *C*, cervix; *V*, vagina; *P*, polypus.

A fibroid starting from the cervix may form a polypus attached to one of the lips of the os (Fig. 231, p. 263).



Fig. 239. Pedunculated subperitoneal myoma. (Hofmeyer.)

Microscopical examination shows that myomas are composed of unstriped muscle-fibres, connective tissue, and fusiform cells. They originate from small round cells, surrounding capillaries which are being obliterated.

A myoma may become *adherent* to the abdominal wall or other organs, and in the course of time it may derive all its nourishment from the ground where it has been implanted, and even become separated from the uterus; or it may lie loose in the abdominal cavity, alimented only by imbibition.

Myomas often give rise to local peritonitis, cellulitis, or ascites. They soften and enlarge at the menstrual periods and may then temporarily protrude from the os, forming an *intermittent polypus*. During pregnancy they swell and soften still more. During involution they become again smaller or may disappear entirely. After the menopause most of them shrink, but in other cases they continue growing.

They are often *œdematous*. *Myxomatous* tissue may develop in the interior, or they may become *sarcomatous*, *carcinomatous*, or *calcified*. They may *slough*, in which way a spontaneous cure may be effected, unless the patient succumbs to septicæmia. They may become *cystic*, either by simple œdema or resorption of myxomatous tissue, or by dilatation of lymph-spaces or lymph-vessels. The *fluid* contained in these so-called *fibrocysts* varies much in quantity and quality. It may become bloody or purulent. Sometimes it coagulates by exposure to the air and it is always rich in albumin. Occasionally it contains detached muscle-cells. When much fluid accumu-

FIG. 240.



Intramural myoma. (Gusserow.)

lates, the cyst may rupture and the contents be poured into the peritoneal cavity.

Etiology.—The cause of the formation of myomas is unknown. They are much more common in nulliparæ than in parous women, but it is a question whether the sterility is the cause or the effect of the neoplasm.

Symptoms.—These are chiefly hemorrhage, leucorrhœa, hydrorrhœa, pain, and those produced by pressure. Menorrhagia and metrorrhagia are caused by the submucous variety and fibroid polypi. Often a considerable amount of a watery fluid is expelled in a gush.

Pain may be due to local peritonitis; to pressure on the sacral plexus of nerves, which induces severe neuralgia in the lower extremities; to tension of the abdominal wall; or to the weight of the tumor. A polypus being expelled through the os incites labor-like pain. Pressure on the rectum occasions constipation; that on the urethra may hinder micturition; that on the bladder may evoke it frequently; that on the ureter may result in hydronephrosis and pyelitis. Pressure on blood-vessels may result in œdema, dilatation of the heart, or myo-

FIG. 241.



Large cactus-shaped uterus full of myomas (extirpated by the author). *

carditis. Large tumors pressing on the lungs and the liver cause dyspnœa and dyspepsia. The tumor may crowd the uterus out of the pelvic cavity, with the development of a prolapse, or, if attached to the fundus, drag this down, originating an inversion. Pressure on the uterine vessels may elicit a blowing sound like the soufflé of pregnancy.

The abdomen may be more or less distended. A tumor is felt there or in the vagina or in both places. It

is generally hard and nodular, but may be soft; and a fibrocyst is even fluctuating. An intraligamentous tumor is felt in the iliac fossa, that extending into the pelvic floor may be traced to the cervix.

Diagnosis.—Before trying to diagnosticate any kind of abdominal tumor, the bowels should be emptied with an aperient and an enema, and the bladder evacuated with a catheter. Next, the physician should always think of *pregnancy*, when the patient is in the child-bearing age. As a rule, menstruation stops in this condition, or is much diminished in amount. The development of the abdomen is regular and more rapid. The cervix and lower uterine segment become soft, ballottement or parts of the fetus may be felt, and the fetal heart-sound may be heard. As a rule, the stomachal and mammary signs of pregnancy are absent in cases of uterine myoma.¹ If the uterus contracts under manipulation, it is gravid. In *hydramnion* to

¹ Garrigues, "Obstetrics," 1902, pp. 92-102.

the signs of pregnancy are added the free fluctuation and the open cervix, allowing the examiner to place his finger right on the ovum. Pregnancy may be combined with the presence of a myoma, the detection of which complication may be very important in regard to treatment. Hemorrhage during pregnancy should always be regarded as suspicious in this respect. The sound can, of course, not be used. The physician must draw his conclusions from the history and a very careful physical examination.

From *hemorrhagic endometritis* myoma differs by the presence of a tumor, which may be felt with the hands or the uterine sound.

The distinction between uterine fibroid and *ovarian tumor* may be difficult or impossible. A pedunculated subperitoneal uterine myoma may be entirely like a solid tumor of the ovary, and a fibrocyst may resemble a multilocular ovarian cyst so much that the most experienced diagnosticians commit errors in differentiating them. But by bimanual examination and the sound the uterus can mostly be felt enlarged and its cavity deepened, if that organ is the seat of the cyst. A fibroid in the posterior wall of the uterus may simulate *retroflexion* (Fig. 211, p. 246); but by bimanual examination or, if necessary, the sound, it is ascertained that the fundus is in its normal position. A myoma in the anterior wall may be taken for *antelexion*, but by inserting the sound and examining through the vagina, the increased thickness of the wall at the site of the tumor may be felt.

Carcinoma of the cervix forms a soft, friable mass, surrounded by a very hard ring. It soon ulcerates, and it secretes a thin fluid, with a penetrating, offensive odor. Cancer of the body is much rarer than myoma, it causes more severe pain, it undermines the constitution, and the corresponding lymphatic glands become infiltrated. Ascites is more common with cancer, and a bloody ascitic fluid is nearly always a sign of malignancy. A sloughing fibroid polypus may be much like an epitheliomatous growth of the cervix, but the microscope shows an entirely different structure.

A fibroid polypus differs from a *glandular polypus* by its hardness. It may not be possible to distinguish it from a *placental* or *fibrinous polypus*, but the beginning of the disease after childbed makes the latter character of the tumor plausible and the microscopical examination shows chorionic or decidual tissue. In regard to *inversion*, the reader is referred to what has been said above (p. 260).

Prognosis.—Small myomas are often harmless. The neoplasm is of benign nature, but may constitute a dangerous affection in many

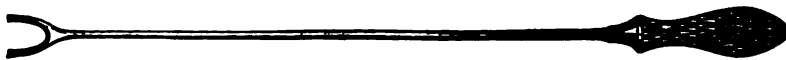
ways, especially through hemorrhage or pressure on important organs. A spontaneous cure is possible, if a polypus is expelled, and may occur also during or after puerperal involution.

Treatment.—Small myomas that do not give rise to any symptoms may be left alone, but should be watched. Generally these tumors demand a more or less active interference. The therapeutic resources are manifold and may be considered in the following order :

- Cut off polypi ;
- Tie and cut predunculated subperitoneal tumors ;
- Lift the uterus ;
- Hæmostatic and anticatarrhal remedies ;
- Galvanochemical cauterization ;
- Curetting ;
- Vaginal enucleation ;
- Ligation of ovarian and uterine arteries.
- Abdominal enucleation—
 - a*, from the uterine wall ;
 - b*, from the broad ligaments ;
 - c*, from the pelvic floor.
- Supravaginal amputation—
 - a*, with retroperitoneal treatment of the pedicle ;
 - b*, with fixation of the stump in the abdominal wall.
- Total hysterectomy—
 - a*, vaginal ;
 - b*, abdominal.

A *polypus* must be mechanically removed. If it shows in the vagina, the cervical canal should be dilated. The tumor is grasped with a traction-forceps, or, if somewhat large, caught in a noose made of tape, which may be carried around the base by means of a *tape-carrier* (Fig. 242), an instrument like a uterine sound ending in a little fork.

FIG. 242.



Routh's tape-carrier.

If the polypus is intra-uterine, it must be made accessible by dilating the cervix with laminaria tents, or by cutting the vaginal portion bilaterally and dilating the remainder with an expanding dilator or incising it in different directions with Simpson's metrotome. When the polypus is seized it may be severed with a few rotatory move-

ments with Thomas's spoon-saw or cut off with strongly-curved scissors (Fig. 111, p. 97).

Large polypi may, after the pedicle is severed, be delivered with a small obstetric forceps, or they may be diminished by *morcellement*: a traction-forceps is inserted in the lower pole and a wedge as large as a hen's egg is cut out. Next, the edge is grasped and pulled down, and another piece cut off, and so forth until finally the pedicle is reached, which is severed with the spoon-saw. If there is any bleeding, the uterus is packed with iodoform gauze.¹

Pedicellate subperitoneal myomas are reached by laparotomy, and the pedicle transfixed, tied, and cut (Fig. 239, p. 270).

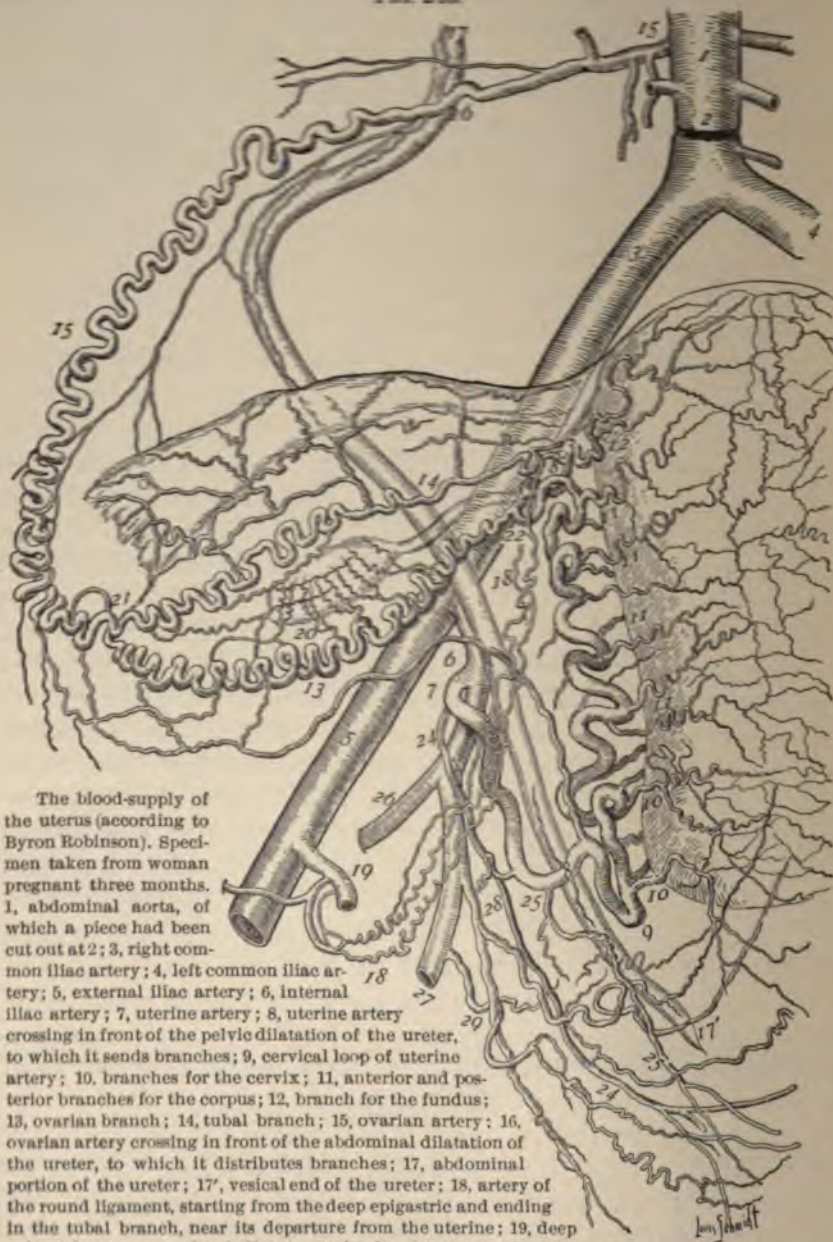
Sessile fibroids may sometimes be treated to advantage by lifting the uterus with a large Gehrung or Thomas anteflexion pessary, which allows a freer circulation of blood and takes off pressure from the rectum, bladder, or ureters. Hemorrhage is combated with ergot, gossypium, and especially the dried mammary gland of sheep, adrenalin, or stypticin internally (p. 50); astringent vaginal and intra-uterine injections; tamponade; curettage; and chemical galvano-cauterization after Apostoli's method. The last is not only an effective hæmostatic, but occasionally a complete cure is obtained, with disappearance of the tumor. The method is, however, not without drawbacks and danger; and since new hæmostatic drugs have been found and the mortality of operations has been much reduced, it is less used than some years ago. Myomas distort the whole uterus, and while some portions are enormously thickened, others measure only $\frac{1}{8}$ inch. If the cautery lies in contact with such an atrophic part of the wall, it may burn right through it, or at least cause local peritonitis and formation of adhesions, which make the prognosis less good, if a radical operation is to follow. Mammary gland extract causes also considerable shrinkage of the myoma.

Vaginal Enucleation.—Small myomas situated in the cervix or the lower uterine segment and impinging on the vaginal vault may often be reached and enucleated either by an incision in the cervical canal or by anterior or posterior colpotomy (pp. 252, 253).

Ligation of the Ovarian and Uterine Arteries.—Ligation of both uterine arteries, either from the vagina (Fig. 74, p. 71) or the abdomen, arrests hemorrhage and causes considerable shrinking of the tumor; but the effect is only temporary. Even all six arteries—the

¹ Garrigues, "Large Uterine Myoma removed by Trachelotomy and Morcellation," Amer. Jour. Surg. and Gynecol., February, 1900.

FIG. 241.



The blood-supply of the uterus (according to Byron Robinson). Specimen taken from woman pregnant three months.

1, abdominal aorta, of which a piece had been cut out at 2; 3, right common iliac artery; 4, left common iliac artery; 5, external iliac artery; 6, internal iliac artery; 7, uterine artery; 8, uterine artery crossing in front of the pelvic dilatation of the ureter, to which it sends branches; 9, cervical loop of uterine artery; 10, branches for the cervix; 11, anterior and posterior branches for the corpus; 12, branch for the fundus; 13, ovarian branch; 14, tubal branch; 15, ovarian artery; 16, ovarian artery crossing in front of the abdominal dilatation of the ureter, to which it distributes branches; 17, abdominal portion of the ureter; 17', vesical end of the ureter; 18, artery of the round ligament, starting from the deep epigastric and ending in the tubal branch, near its departure from the uterine; 19, deep epigastric artery; 20, five helicine arteries for the ovary; 21, anastomosis between ovarian artery, ovarian branch of uterine artery, and tubal branch of uterine artery; 22, beginning of ovarian branch; 23, starting-point of tubal branch; 24, vaginal artery, starting from the uterine, near its origin; 25, vaginal artery, starting from the uterine, near the cervical loop; 26, obturator artery; 27, internal pudic artery; 28, 29, vesical arteries.

uterine, the ovarian, and that of the round ligament (Fig. 243)—have been tied, and still the hemorrhage recurred.

Abdominal Enucleation.—If there is only one or a small number of myomas of moderate size, and on account of the limited loss of blood there is reason to believe that they are intramural or subperitoneal, they may be removed by laparotomy and enucleation, with preservation of the uterus—*myomectomy*. To avoid hemorrhage, an elastic ligature is laid around the cervix and broad ligaments. An incision is carried over the top or around the base of the tumor. This is shelled out. Superfluous tissue is trimmed off and the cavity closed by uniting the walls with a running tier-suture of catgut. When there are several tumors, multiple incisions may be necessary. If accidentally the uterine cavity is opened, the endometrium is brought together with a separate suture. If necessary, the whole cavity may be opened from the fundus to near the internal os by an incision through the anterior wall.

For removing an intraligamentous myoma, if possible the ovarian and uterine arteries of that side are ligated; but even without this precaution against hemorrhage a transverse incision is made through the peritoneal coat, which is peeled off, and the tumor is grasped with traction-forceps and pulled up. The enucleation proceeds from above downward and from without inward. In most cases the tumor comes out without pedicle, in others one is formed of the tube or part of the uterus or of the tissue at the inner lower angle of the broad ligament, including the uterine artery. A large cavity is left. If there is no bleeding, the bottom of it is perforated with a forceps, into the jaws of which is passed a T-drain from the vagina, when the tube is drawn up into the cavity. Finally, the peritoneum is stitched together over it. If the wall oozes, the hollow may be filled with a Mikulicz tampon and the edges of the cavity stitched to the parietal peritoneum, or the bleeding places may be sutured or touched with Monsell's solution or the thermocautery; or hemorrhage may be stopped with hot water.

Enucleation from the pelvic floor is still more difficult, but is carried out in a similar way.

Hysterectomy.—If it is deemed necessary to sacrifice the uterus, it may be done by the vaginal route—*vaginal hysterectomy*—or the abdominal route, and in the latter case either by *supravaginal amputation* or *total extirpation*, or *panhysterectomy*. Vaginal hysterectomy may be performed with ligatures or clamps.

Vaginal Hysterectomy with Ligatures.—The patient lies on her

back with elevated legs. The lower end of the table is raised about four inches. The external genitals are shaved and disinfected, and Garrigues's weight speculum introduced or the posterior vaginal wall and the perineal body pressed down with a single-blade speculum (Fig. 244) by an assistant. The anterior wall is held up with a short,

broad blade. The cervix is seized laterally with a bullet-forceps and dilated and the interior of the uterus curetted and wiped out with gauze wound around a forceps. Next, each lip is seized with a four-pronged traction-forceps (Fig. 245) and the cervix moved up and down to locate the uterovaginal junction, which lies about 1 inch above the os behind and $\frac{1}{2}$ an inch in front. Here two transverse incisions are made, leaving a lateral bridge $\frac{1}{2}$ inch wide and $\frac{3}{8}$ inch long.



Segond's specula. A, anterior blade; B, posterior blade.

Pulling the cervix steadily down, the operator separates it behind. When the peritoneum is reached, this is incised, and after temporary removal of the posterior blade, the opening enlarged by lateral traction with the two forefingers till it admits two or three fingers.

FIG. 245.



Péan's four-pronged traction-forceps.

A similar separation between the bladder and the uterus is effectuated in front, when the uterus is held only by the broad ligaments and the parametria. These are tied off in portions, passing catgut ligatures with Schroeder's needle (Fig. 73, p. 71) from below up-

ward. First, two ligatures are passed on the left side, then on the right, and each portion is cut loose from the uterus as soon as tied, whereby this becomes more movable. Next, similar ligatures are carried through the left broad ligament, comprising so much tissue that, when tied, it has the thickness of a lead-pencil. As the upper parts of the broad ligament are not easy to reach, the operation is much facilitated by passing a strong silk ligature, with J. B. Hunter's needle (Fig. 246), from behind over the upper border of the ligament and drawing it down. This needle is constructed on the principle of Bellocq's tube for tamponing the nose. When the uterus is freed on this side, it is readily drawn into the vagina and the right ligament is tied off in a few portions.

If the appendages are affected, the ligatures are passed outside of them or they are removed separately, but for the patient's general health it is better to leave one or both ovaries. Finally, the wound

FIG. 246.



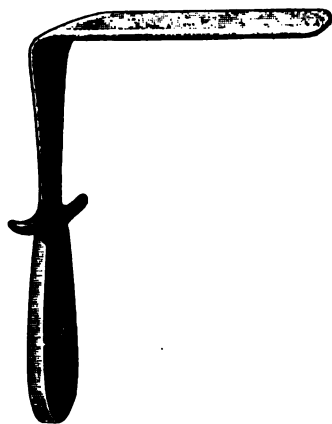
J. B. Hunter's needle.

is closed over the stumps, which are drawn down into the vagina. This makes the healing process much shorter, so that the patient need only remain one week in bed. If for some reason it cannot be done, the peritoneum may be stitched to the vagina and the opening packed with gauze, when it will heal by granulation.

Vaginal Hysterectomy with Clamps.—Instead of leaving a lateral bridge of mucous membrane, the cervix is surrounded by a circular incision, and if the cervix is small and the body of the uterus large, a lateral incision $\frac{3}{8}$ inch long is made at right angles to the first, corresponding to the transverse axis of the os. The uterus is separated all around with small nicks of the scissors, and mostly with the finger-nails. The peritoneum is opened behind, as described above; in front no attention is paid to it; on the sides the parametria can be pushed up nearly to the base of the broad ligaments. No retractor should be inserted between the uterus and the bladder, as it draws the ureters together and may wound them. It should be held flat against the mons Veneris, at right angles to the uterus, and crowd the bladder up.

So far no attention whatsoever is paid to hæmostasis, but when the operator has come as far up as he can in front of the uterus and is near the broad ligaments on the sides, he places two strong pairs of forceps (Fig. 77, p. 73), one on either side, over the lower portion of the broad ligaments, by which the uterine arteries are compressed. The clamps are placed near the uterus and the tissue cut with scissors close up to the clamp and near to their ends, which makes the uterus much more movable. The posterior speculum is then dispensed with. As soon as possible the uterus is anteфлекed and the fundus drawn into the vagina, for which purpose it may be necessary to split the anterior wall of the uterus, or even to cut pieces out of it—so-called *morcellement*. The appendages are manually drawn into the wound; if necessary, after separating adhesions by the touch alone. All the other steps of the operation are done under the guidance of the eye, and, as stated above, healthy appendages are better left undisturbed. When they are to be removed, a strong pair of forceps (Fig. 76, p. 72), closing from the end backward, is placed on the left broad ligament, outside of the appendages, from above downward, until it comes in contact with that compressing the lower portion of the ligament. This upper forceps closes the ovarian vessels

FIG. 247.



Péan's écarteur.

in the infundibulopelvic ligament and the artery of the round ligament. In a typical case only four clamps are left in the pelvis, but it may be necessary to employ some additional ones.

When the uterus has been removed, the operator should introduce Péan's *écarteurs* (Fig. 247),—two long, narrow blades, by means of which one can see deep into the abdomen and look for hemorrhage. When the bleeding points have been secured with other clamps, the wound is tamponed with long strips of dry sterilized gauze, which are carried in just beyond the jaws of the clamp. In the vagina gauze is packed

loosely around the instruments to avoid pressure necrosis. The rings of each forceps are tied together to prevent their accidental opening and a self-retaining rubber catheter is introduced into the bladder (Fig. 248). This is inserted with a uterine sound and closed with

an artery-forceps, which is removed every two hours in order to give an outlet to the urine. The clamps and vaginal dressing are removed after forty-eight hours. The abdominal gauze may be left in for six or eight days and is withdrawn gradually, cutting off a piece every day; but if there is any fever, it is extracted at once. If the omentum sinks down, either during the operation or after removal of the tampon, it must be pushed high up with a pad on holder to prevent its agglutination to the wound. If the intestine adheres to the uterus, a little adhesive tissue should be left on the former.

Comparison between Ligature and Forceps.—The ligature method is easier and safer, but forceps can be applied where there is not tissue enough to form a button. The removal of the forceps and abdominal tampon is very painful.

Morcellement.—If the uterus is too large to pass through the opening in the vagina, it may be incised in the median line of the anterior wall, or portions may be cut out of it, or it may be divided into two halves in the median line. Tumors may be cut out with scissors and

FIG. 248.



Petzer's self-retaining soft-rubber catheter.

knife also from the interior of the womb (Fig. 249). In all these operations the uterine arteries are first clamped. Further hæmostasis is obtained by pulling the uterus steadily down, and as soon as feasible drawing the fundus into the vagina, and thereby twisting the broad ligaments. Before cutting off any piece of the uterine wall, that which is situated above it is secured by a traction-forceps.

Limits of Vaginal Hysterectomy.—Tumors reaching the umbilicus, or even mounting a little higher, can be removed by the vagina, using morcellation; but, generally, the size of a fetal head is regarded as the limit. Larger tumors are removed through the abdominal wall.

Supravaginal Amputation of the Uterus.—We distinguish three steps in the operation:

1. The *abdominal section, or laparotomy*;¹ 2, the *removal of the uterus*; and, 3, the *closure of the wound*.

¹ Some authors use the term "*celiotomy*," which in every respect is an unfortunate innovation. Laparotomy has not only nearly a century's precedence, has been adopted in all languages, has entered into combination with other words and

1. *Laparotomy*.—An incision is made through the skin in the median line from a little above the symphysis pubis to the umbilicus. If the abdomen is distended by a large tumor, caution should be taken not to cut too deeply. The subcutaneous fat and the superficial fascia are divided, and the aponeurosis of the flat abdominal muscles

FIG. 249.



Morcellment of myomatous tumor. (Péan.)

exposed. Next, this is severed in the linea alba, when the preperitoneal fat appears. This is seized with two pairs of artery-forceps and separated, partly bluntly, partly with small nicks of the knife, down to the peritoneum, which is likewise lifted with the two pairs of forceps and a small opening made into it, large enough to admit the forefinger.

produced derivatives, and is pleasant to the ear ; but it is even to be preferred from an etymological stand-point : *ἡ λαπάρα* means the flank, the region between the ribs and the crest of the ilium, and can by a slight extension, a principle pervading all human speech, be applied to the rest of the abdominal wall, while *ἡ κοιλία* can signify 1, the abdominal cavity ; 2, the stomach ; 3, stools ; 4, the pulp of the finger ; 5, any cavity. So that "cœliotomy" might as well indicate an incision for a felon as abdominal section.

Bleeding vessels are all the time clamped as layer after layer is cut, so that the wound is dry before the peritoneum is opened. Great care is taken not to wound the omentum or intestine. The incision in the peritoneum is enlarged with knee-bent scissors, the inner blade of which should end bluntly (Fig. 250). At the lower end the operator

FIG. 250.



Knee-scissors.

goes close to the bladder, at the upper he extends the incision, with scissors if necessary, beyond the umbilicus, keeping to the left of it. An artery-forceps is fastened to the peritoneum on each side, so as to be able readily to find it in closing the wound.

2. *Removal of the Uterus.*—Now the uterus is lifted out of the abdomen, which is facilitated by boring a corkscrew into its anterior surface or grasping the fundus with strong forceps (Fig. 251). Next,

FIG. 251.



Baer's forceps.

the patient's pelvis is raised, the intestines are held down with large pads, and the abdominal wound is spread open with large retractors (Fig. 252). With Schroeder's needle a medium-sized catgut ligature is carried around the ovarian vessels in the infundibulopelvic ligament, taking care to leave the upper edge of the ligament free above the

ligature, which prevents its slipping. If there are complications, the easiest side is chosen, otherwise the left is usually preferred. A

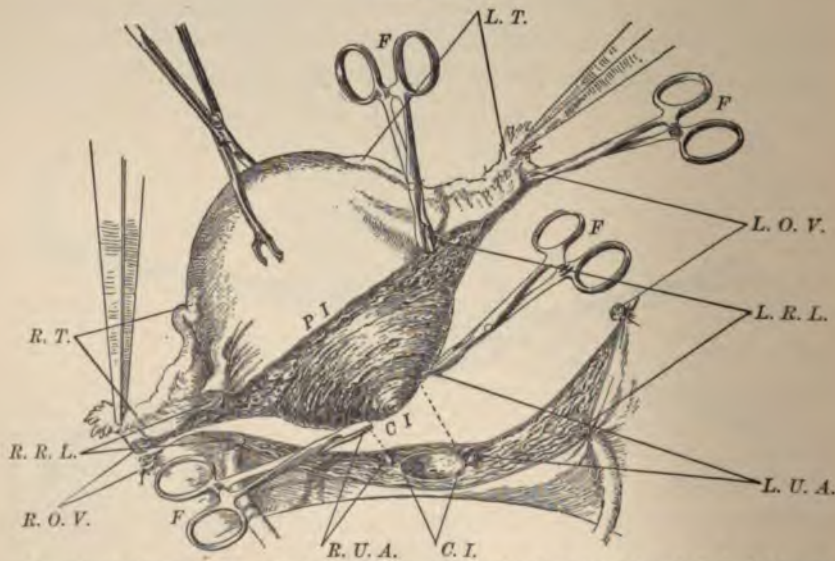
FIG. 252.



Landau's laparotomy retractor.

pressure-forceps is placed on the ligament nearer to the fimbriæ, and the tissue cut between the ligature and the forceps (Fig. 253).

FIG. 253.

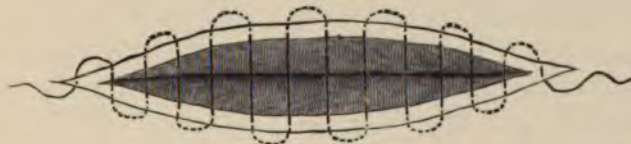


Supravaginal amputation. *L. O. V.*, left ovarian vessels; *L. T.*, left tube; *L. R. L.*, left round ligament; *P. I.*, peritoneal incision; *L. U. A.*, left uterine artery; *C. I.*, cervical incision; *R. U. A.*, right uterine artery; *R. R. L.*, right round ligament; *R. O. V.*, right ovarian vessels; *R. T.*, right tube; *F. F. F.*, compression-forceps.

A second ligature is placed on the round ligament, a forceps placed above it, and the first incision through the broad ligaments continued

between them. Next, a superficial incision is made from this point across the uterus to the corresponding point on the right round ligament about a finger's-breadth above the bottom of the vesico-uterine pouch. The lower flap and the bladder are separated from the uterus and supravaginal portion of the cervix. An assistant draws the uterus to the opposite side, and the operator inserts his thumb and forefinger between the two layers of the lower portion of the left broad ligament until he sees or feels the left uterine artery at the side of the cervix, which he then ligates, places a forceps above the ligature, and continues the incision between the two. Next, he severs the cervix transversely; and when the last fibres are incised or torn, the uterus being drawn all the time over to the assistant's side, the right uterine artery becomes visible and is tied and severed. After that the right round ligament and infundibulopelvic ligament are tied and cut by the continuation of the same incision which started at the corresponding point of the first side.

FIG. 254.



Marcy's subcuticular suture.

Besides the six arteries mentioned above, often one or two more may spurt when cut, and are then clamped and tied.

3. *Closure of the Wounds.*—The cervical stump is hollowed out and its edges united in an anteroposterior direction by three catgut sutures. Thereafter the peritoneal edges are stitched together with a running suture of the same material. If any blood has accumulated in the peritoneal cavity, it is wiped off with pads on sponge-holders,—which technically is called the *toilet of the peritoneum*,—and finally the omentum is drawn down and the abdominal wound closed. This is done best by uniting the edges of the peritoneum with a running suture of fine catgut; next, the edges of the aponeurosis and fascia, without including the muscular tissue; and, finally, the skin and subcutaneous fat. This last step may be performed either with deep interrupted silkworm sutures and superficial silk sutures or by the so-called subcuticular suture (Fig. 254). The advantage of the latter is that it does not perforate the epidermis and upper portions of the

skin, where lurk microbes that, according to most authors who personally have investigated the matter, cannot be dislodged mechanically or killed by antiseptics. An absorbable suture is carried only through the subcutaneous connective tissue and the edge of the skin. It is introduced at one end of the wound, carried for about $\frac{1}{2}$ inch parallel to the edge of the wound, then brought out at the edge of the skin and reinserted in the other edge, right opposite the point of exit. Then it is carried $\frac{1}{2}$ inch on this side and brought over to the first edge, and so forth to the other end of the wound. By pulling on the ends of the thread the sides of the incision are brought together, the wound is dusted with iodoform and painted with iodoform colloidum, covered with a pad, over which the suture is tied. If the wound is long, several sutures meeting one another at the ends are used.

If the patient is in a low condition, the abdominal wall should be closed in the most expeditious way, which is by interrupted sutures, an inch apart, going through the whole thickness of the wall.

When the wound is closed, it is dusted with iodoform and covered with iodoform gauze, a layer of gutta-percha tissue, which extends beyond the gauze and adheres to the skin, layers of sterilized gauze, and cotton held in place by six straps of adhesive plaster sewed to tapes. The straps are fastened outside of the dressing and the tapes tied in front of it. Finally, the abdomen is surrounded by a many-tailed bandage secured with a double row of safety-pins.

Preparation.—The preparations for operations are described in the GENERAL DIVISION, page 79, *et seq.*

After-Treatment.—After the operation the patient is placed in her bed surrounded by half a dozen bottles or bags filled with hot water. If there is no shock, she is allowed to sleep till she wakes up spontaneously. If she is suffering from shock, the measures recommended on p. 90 should be resorted to. Vomiting is treated with deep inhalations, with or without acetic acid, and by raising the head somewhat. If it persists, hydrochlorate of cocaine ($\frac{1}{4}$ gr.—15 milligrammes) is given every hour, or dilute hydrocyanic acid is administered in a refreshing medicine:

R Acidī hydrocyan. dil., ℥ss (2 grammes);
 Acidī citrici,
 Sodii bicarbonat., āā ℥ii (8 grammes);
 Syr. rubi idæi, ℥ss (15 grammes);
 Aquæ destill., q.s. ad ℥vi (180 grammes).—M.
 Sig.—A tablespoonful every 1, 2, or 3 hours.

The urine should be drawn at least four times a day, if the patient cannot pass it. Opiates should be avoided as far as possible. Pain in the wounds may be relieved to some extent by the application of an ice-bag to the abdomen outside of the dressing. Thirst is alleviated by teaspoonful doses of hot water or ice-water, or by injecting a pint of tepid water into the rectum. The first day no food is given. The following days the patient may have tea, coffee, milk, thin oat-meal gruel, farina, and beef tea, in frequent small quantities (not over two ounces at a time). After the first week she may have common food.

The bowels are moved on the third day with sodium sulphate, a heaping teaspoonful, repeated, if necessary, every four hours. If salts are vomited, calomel, 1 grain (6 centigrammes) every hour, is substituted until ten doses have been given. If that does not have the desired effect, an oxgall enema is given. If needed, the bowels are thereafter kept open with aperients.

The sutures are removed on the eighth day and replaced by narrow strips of rubber or zinc oxide adhesive plaster cut out in the middle so as to leave free escape to any wound secretion. A similar, but somewhat simplified, dressing is put on and changed after another week. At the end of the third week the patient may get up. She should wear an abdominal supporter for the next three months.

Total Abdominal Extirpation of the Uterus.—When the uterus has been removed as described above, the stump of the cervix may be removed, too.* For this purpose it is seized with a traction-forceps and separated with scissors, partly closed and partly cutting all around, and cut transversely loose from the vagina. Or instead of cutting the cervix, after severing the left uterine artery, it is separated on the same side with scissors; a traction-forceps is inserted in the vaginal portion; the cervix is freed from the vagina, and it is drawn over to the right side (Fig. 255). After that the right side is treated as described above. The removal of the cervix nearly always gives rise to some bleeding, because the internal iliac artery often continues below the departure of the uterine and gives off the vaginal arteries, either as one common or two or three separate branches. Whatever arteries spurt are clamped and later tied. The peritoneum is stitched all around to the vagina to insure perfect hæmostasis, and an iodoform gauze drain is placed in the opening, or this may be closed.

Transverse or Arched Abdominal Section.—The classical incision in the median line of the abdomen, which we have described above, leaves

a conspicuous cicatrix. In order to make the lateral parts of the pelvis accessible the wound must be extended far up, and is often followed by a ventral hernia. To obviate this, the incision is made transversely through the skin, subcutaneous fat, superficial fascia, and the aponeurosis of the flat abdominal muscles in front of the recti muscles. This incision is made in the furrow that in fat women forms the upper boundary of the mons Veneris, or in the portion of skin covered with pubic hair. The flaps are dissected from the recti muscles upward

FIG. 255.



Total hysterectomy. (Second.) The uterus is tilted over to the right side with three pairs of forceps attached, corresponding to the three ligatures. The cervix is turned over to the same side, and the right uterine artery lies between it and the opening in the vagina.

and downward and the muscles are separated from each other, as usual, in the median line, and also the peritoneum is incised in this situation. Still more room can be obtained by making the incision arched with the concavity turning upward. This may be done to such an extent that the base of the flap is only three finger-breadths from the umbilicus. In closing the wound, the peritoneum and the recti muscles are tied together with sutures, and another row of sutures unite aponeurosis and skin. While this is being done, all blood and air are pressed out from under the aponeurosis, in order to avoid the development of a hæmatoma and an abscess.

This method is applicable to medium-sized myomas, and nearly all other pelvic operations, inclusive of pyosalpinx and ovarian abscess of gonorrhœal origin. When the inflammation is septic, it is safer not to use it, on account of the possibility of the infection of the large subaponeurotic wound. The advantages of the method are considerable. The lateral portions of the pelvis are reached with great facility. The patient being in elevated-pelvis position, the intestine is hardly handled at all, which probably accounts for the smaller mortality. The line of suture being crucial, there is only one weak point in the abdominal wall, where the two lines of incision cross each other, and this is strengthened by the united recti muscles lying behind it. While in the longitudinal incision tension separates the edges, in the transverse they remain in contact. The same applies to the skin. This prevents the formation of a hernia and allows the patient to get up and resume her occupation earlier (10-14 days). To this comes that in cases in which a small incision suffices, a cosmetic advantage is obtained by making the incision in a natural furrow or in a portion of the skin where it later will be covered by hair.

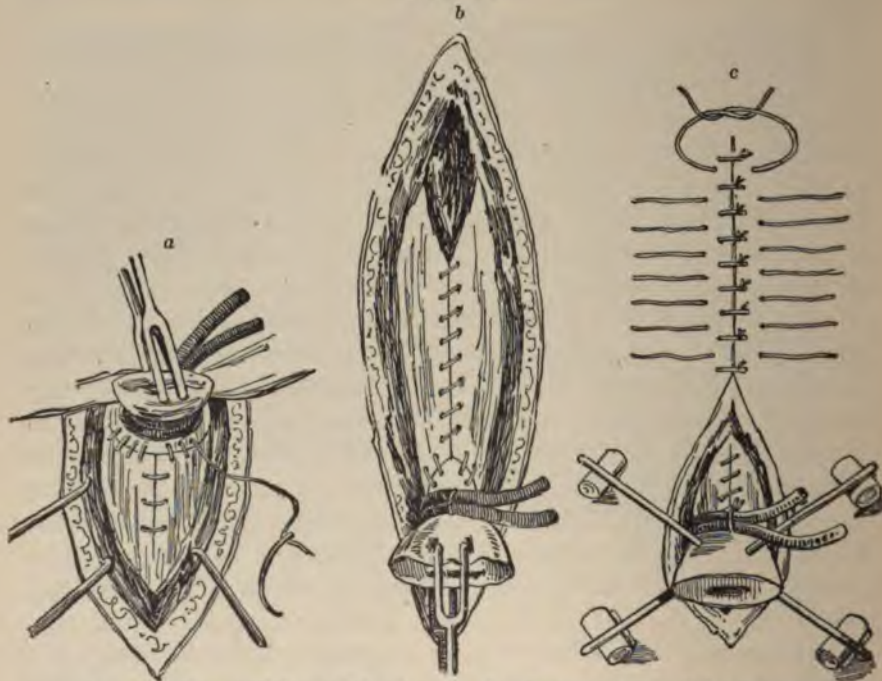
Comparison between Vaginal and Abdominal Hysterectomy.—If the vaginal route is available, it should be preferred, because it entails much less shock, requires a simple after-treatment, does not leave any visible cicatrix, predisposes less to hernia, and allows the patient to resume work in shorter time. On the other hand, the vaginal route is more difficult on account of the limited space. Hemorrhage is more troublesome to check, adhesions are harder to separate, and the bladder and intestine more exposed to injury and less accessible for repair. The pelvic cavity cannot be seen so well and the abdominal not at all. If tissue is left to mortify, it emits an offensive odor.

Comparison between Supravaginal Amputation and Total Extirpation of the Uterus.—In a myomatous uterus, where the cervix is healthy or tumors are easily enucleated from it, supravaginal amputation is the better operation; it is easier and more expeditious, there is much less hemorrhage, the vagina preserves its full depth, the stumps of the broad ligament and of the cervix hold one another so as to prevent prolapse of the vagina. There is no danger of vaginal hernia. Finally, the mortality is only one-half that of the total extirpation, the chief cause of which is probably the hæmostasis, which may take as much time as all other steps of the operation together. But if there is the slightest suspicion of malignant degeneration of the myoma, the whole uterus should be removed.

Extraperitoneal Treatment of Pedicle.—If for any reason supravaginal amputation, with retroperitoneal treatment of the stump, cannot be accomplished, the surgeon can fall back on the otherwise abandoned extraperitoneal treatment.

Hegar's Method (Fig. 256).—An elastic tube as thick as the little finger is laid twice around the cervix and broad ligaments. Only, if the tension is too great or the mass too voluminous, the ligaments

FIG. 256.



a, suture of peritoneum below pedicle; b, suture of peritoneum above pedicle; c, stump transfixed with crossed pins. Abdominal wound partially closed with superficial sutures. Deep ones placed.

are first cut between a row of double ligatures before applying the cord. This is drawn very tight and the ends crossed once. Then a strong silk thread is held over the crossing, the second hitch made above this, and the silk tied over the elastic ligature. Next, the uterus is cut off $1\frac{1}{2}$ to 2 inches above this and the peritoneum of the stump stitched with a fine curved needle and a continuous catgut suture to that at the lower end of the incision. The suture is continued on the upper portion of the peritoneum, and the other layers

of the wound are closed, as in other laparotomies, leaving a circular furrow around the stump. This is transfixed with a pair of steel pins, the ends of which are made harmless with little caps. The cut surface is seared with Paquelin's cautery, and covered, as well as the surrounding furrow, with a mixture of 3 parts of tannin and 1 part of salicylic acid. Finally, the whole is dressed, as in other laparotomies, and the wound need not be disturbed for a week, when the sutures are removed. The stump falls off after fifteen to twenty days, leaving a deep funnel-shaped cavity, which is dressed daily with iodoform gauze until it is healed.

Fibrocystic tumors, or *cystic myomas*, that can be clinically recognized as such, are rare. They are mostly lymphangiectatic and contain a lymph-like fluid. (Compare p. 271). Generally they are pedunculated. They are soft or fluctuating, grow fast, and soon give rise to pressure symptoms. They are rich in large blood-vessels, form generally extensive adhesions, and may acquire enormous dimensions.

The *treatment* is exclusively surgical. Pedunculated tumors are tied and cut off. Interstitial ones are removed by supravaginal amputation, or total extirpation of the uterus. Intraligamentous tumors must be enucleated. But if the radical operation is too difficult, it may be safer to split the cyst, evacuate the contents, stitch the edges of the incision to those of the abdominal wall, and pack it with iodoform gauze, when it shrinks and heals by granulation.

D. SARCOMA.—Under the popular name of *cancer* are united pathologically different tumors which clinically have the common feature of being malignant,—that is, undermine the constitution and end in death. To this group belong *sarcoma*, *carcinoma*, *malignant adenoma*, which is only the first stage of certain carcinomas, and some varieties of *papilloma*.

Sarcoma is much less common than carcinoma, about in the proportion of 1 to 40. It chiefly affects the body of the womb; in the cervix it is rare. It may be *circumscribed*, *diffuse*, or *papillary*. The *circumscribed* forms tumors like myomas, and may, like them, be submucous, subperitoneal, or intramural. The submucous may become a polypus (Fig. 257). It has very rarely a capsule. Generally the tissue is soft and brain-like. Sometimes it originates in a myoma.

The *diffuse* variety usually starts from the submucous connective tissue and spreads to the mucous membrane and the muscular coat, and may perforate the whole wall, forming an abdominal tumor.

Papillary sarcoma starts from the mucous membrane of the cervix as a hypertrophy of the papillæ. The tumor hangs out from the os and takes in the vagina a racemose appearance,—*sarcoma botryodes* or *hydropic papillary sarcoma* (Fig. 258),—much like a vesicular mole. The berries vary in size from a shot to a grape, and contain a clear fluid.

The *diagnosis* from a *mucous polypus* is difficult before the peculiar œdema and formation of berries has developed, but mucous polypi contain large glands visible on the cut surface with the naked

eye, and in many places flat epithelium on the surface. If a supposed mucous polypus is reproduced after removal, there is strong suspicion of its being sarcomatous. A microscopical examination clears up all doubt. Sarcomas consist of large or small round cells, spindle cells, or giant cells, and

FIG. 257.



Polypous myxosarcoma of the mucous membrane of the uterus. (Ruge.)

FIG. 258.



Hydropic papillary sarcoma. (Ruge.)

that of the mucous membrane often contains epithelial cells, so that a transition is made to carcinoma. Groups of cells are surrounded by bands of connective tissue, which impart a fasciculated appearance to the growth, even macroscopically. Sarcomas may invade neighboring organs and form metastases in remote parts. They may become cystic, and are then called *cystosarcomas*. They do not ulcerate so rapidly as do carcinomas.

Etiology.—The cause of sarcoma is unknown. It is most common after the climacteric; but, different from carcinoma, it is not rare in young persons, and may even be congenital.

The *symptoms* are in the beginning like those of myoma—bleeding, leucorrhœa, and pain; but soon there comes a continuous sero-sanguinolent, offensive discharge; masses like brain-substance or raw fish-meat may be expelled from the uterus; the patient becomes pale and emaciated, loses her strength, and finally succumbs.

Diagnosis.—As just stated, sarcoma of the body is in the beginning much like *myoma*, but differs from it by the cachexia it gives rise to. It is more painful. If the cervix is dilated, a finger introduced into the uterus feels the soft tumor and may even penetrate it and tear off pieces from it, which, examined microscopically, show the cellular structure. If a supposed myoma is reproduced after removal,—*recurrent fibroid*,—it is probably sarcomatous. Sarcoma may resemble *hyperplastic endometritis*, but differs from it by sometimes forming a large polypus hanging out from the os or by the spontaneous expulsion of portions of the tumor, and by the cachexia. The epithelial cells of the utricular glands in scrapings are unchanged in endometritis, while in sarcoma they break down into sarcomatous cells. The differentiation from *carcinoma of the body* may be impossible, and is of no practical value, since the treatment is the same. Sarcoma may form a polypus emerging from the os, which carcinoma never does. It does not ulcerate so soon. It spreads more slowly to the neighboring organs.

The *prognosis* is bad, if the disease is left to itself.

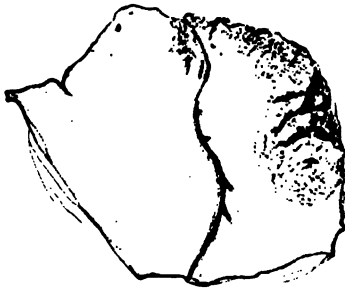
The *treatment* consists in the speedy total extirpation of the uterus and its adnexa, either by vaginal or abdominal section. Morcelllement is out of the question, on account of the danger of infecting the surrounding tissue. The prognosis in regard to total recovery after the operation is better than in carcinoma; but the edematous papillary sarcoma is particularly disastrous, every case known having ended fatally.

If a radical operation is impossible, palliative measures should be taken. A sarcomatous polypus may be cut off and the base cauterized. Curetting followed by cauterization may relieve hemorrhage for a time.

E. CARCINOMA.—Carcinoma is a malignant neoplasm composed of polygonal epithelial cells, mostly arranged in alveoli of connective tissue. It attacks very often the uterus, especially the cervix, where it is found twenty times more frequently than in the corpus.

Pathological Anatomy.—*Carcinoma of the vaginal portion* originates from new-formed glands and may penetrate between the mucous membrane and the outer limit of the cervix. Or it may take a papillary shape and grow downward, filling the whole vagina—so-called *cauliflower excrescence*. Or it may develop as a flat ulceration which is designated *rodent ulcer* (Fig. 259).

FIG. 259.



Flat carcinomatous ulceration of the vaginal portion. (Ruge.)

Carcinoma of the cervix begins as nodules in or under the mucous membrane of the cervix. It starts from the glands or the connective tissue and extends outward, without showing at the os or invading the body (Fig. 260).

Carcinoma of the corpus may be *primary* or *secondary*. The *primary* originates in the surface epithelium or the epithelium of the glands of the mucous membrane of the body of the uterus. It may be *diffuse* (Fig. 261) or *circumscribed*. The latter forms a tumor, which may take the shape of a polypus (Fig. 262). The sec-

FIG. 260.



Carcinoma of cervix. (Ruge.)

ondary is mostly due to extension from neighboring parts, especially the cervix (Fig. 263), but in cases of carcinoma of the cervix the affection often appears separately in the wall of the body (Fig. 264).

In regard to the histological structure, different varieties of carcinoma are found in the uterus. Flat-cell carcinoma, or epithelioma, is composed of flat epithelial cells, arranged concentrically so as to develop so-called *cancer nests*, or *cancer pearls* (Fig. 265). *Adenoid carcinoma* (Fig. 266), on the other hand, consists of columnar epithelial cells, which frequently break up into medullary bodies. It is characterized by its tubular formations in manifold convolutions. When the cellular elements predominate, the tumor is soft and is termed *medullary carcinoma*. When, on the other hand, the connective tissue constitutes most of the tumor, it is hard, and is named *scirrhus*, or *fibrous*

FIG. 261.



Diffuse carcinoma of the corpus uteri. (Ruge.)

carcinoma. Of these the medullary variety is the one that grows fastest and most rapidly puts an end to the patient's life.

Carcinoma in course of time extends to the neighboring organs and may produce a urinary or fecal fistula. The corresponding lymph-glands become infiltrated. Metastases are rare.

Etiology.—Carcinoma of the uterus is a disease of advanced age, in which respect it differs from sarcoma. It is much more common among the poor than among the wealthy. It is sometimes hereditary from parents having the same disease or affected with tuberculosis or syphilis. Carcinoma of the cervix is usually due to childbirth, espe-

cially laceration of the cervix, while that of the corpus is comparatively frequent in nulliparæ. The disease predominates in certain localities. Many think it is due to a germ; some accuse wooded districts; others attribute the disease to immoderate use of animal food. It can be carried with the blood from one part of the body to another in the same individual, but is not contagious, as may be concluded from the frequency of carcinoma of the cervix and the great rarity of it in the penis.

FIG. 262.



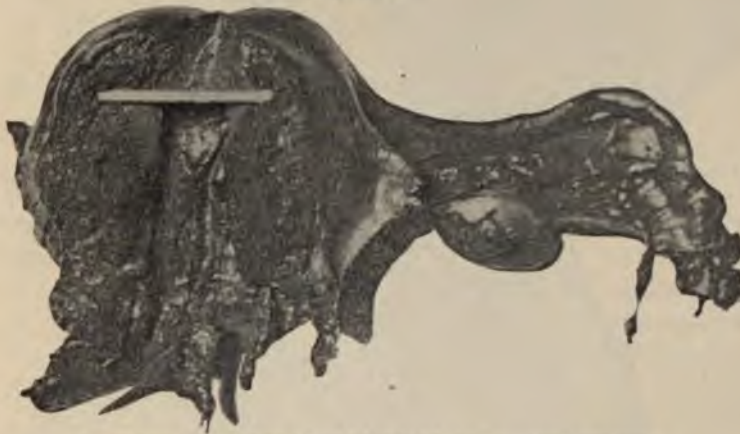
Circumscribed carcinoma of the body. (Ruge.)

Symptoms—Unfortunately, the symptoms are so little marked in the beginning that most cases come under observation so late that they are either inoperable or that even the most thorough extirpation fails to arrest the progress of the disease. Hemorrhage, leucorrhœa, and pain are common in any affection of the uterus; but there are particular circumstances which may awake suspicion. Thus, if a woman in the climacteric age reports that her menstruation has come back after having been discontinued for a year or longer, she is most likely deceived in the interpretation she puts on the loss of blood.

Some complain of a little bleeding after coition. Others have a leucorrhœa streaked with blood. In some cases there is a dull ache or shooting-pain in the hypogastric or sacral region. By vaginal examination one is apt to find a torn cervix that is indurated and bleeds readily. Hard nodules may be felt in the mucous membrane. At the same time the tissue may be so friable that particles can be broken off with the nail. Sometimes the uterus is tender on pressure. In beginning carcinoma of the body hemorrhage and leucorrhœa may be the only symptoms.

As the disease develops, all these symptoms increase and new ones supervene. There are severe and frequent hemorrhages. The

FIG. 263.



Carcinoma of the cervix extending into the corpus. (Author's case.)

discharge becomes purulent or watery and has a pungent odor. The pain becomes more severe and allows the sufferer no rest day or night. The skin of the inside of the thighs, irritated by the acrid discharge, itches or becomes excoriated. Often cystitis occurs. If a ureter is compressed, symptoms of hydronephrosis are developed, and if both become impervious, anuria sets in, followed by coma, convulsion, and death. The patient loses her appetite, complains of thirst, nausea, vomiting, eructations, and constipation. The abdomen is often swollen; sometimes ascitic fluid collects in it and the veins in the wall become distended. Frequently peritonitis arises. In some patients dysentery occurs. The hemorrhoidal veins are also swollen in many cases. Thrombi may form in veins and arteries of the pelvis and lower

extremities, causing great œdema and neuralgia. A piece torn off from such a venous thrombus may be driven into the pulmonary artery and cause instant death. The lymph-glands of the pelvis and groin are felt enlarged. Septicæmia is not common, inflammatory action forming a wall around the affected parts. The woman loses flesh and strength, and her skin takes a yellowish, ashy color.

By vaginal examination the uterus is in advanced cases found immobile, the vaginal vault hard as a board. Sometimes a large,

FIG. 264.



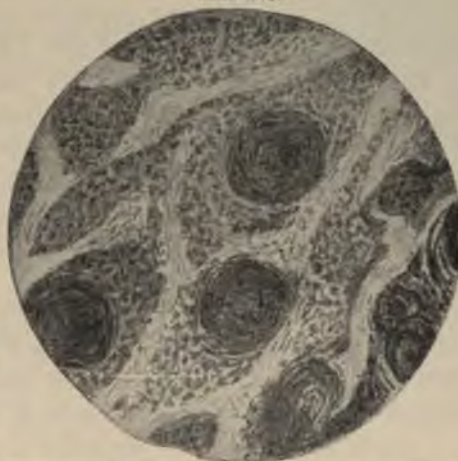
Carcinoma of the cervix with metastasis in the corpus. (Ruge.)

friable polypus fills the vagina and bleeds on touch; or the cervix is the seat of large tumors or of a crater-shaped ulceration. Hard nodules may be felt in the parametria and broad ligaments. In corporeal carcinoma the uterus is enlarged, and sometimes a tumor may be felt in the wall or the cavity.

Diagnosis.—It is of the greatest practical importance to diagnosticate carcinoma early, which not only makes a radical operation pos-

sible, but surrounds it with hope of perfect recovery. However, as just stated, in the beginning the symptoms are so little marked, that it is very difficult to recognize the dread disease. A wrong diagnosis may be calamitous to the patient in one of two ways. The only effective treatment may be delayed till it comes too late; or, on the other hand, a uterus which is healthy or only the seat of inflammatory disease may be extirpated. *Erosions* may be much like beginning carcinoma, but yield easily to treatment. A papillary excrescence surrounded by inflamed follicles is likely to be benign. Beginning carcinoma has a sharp boundary-line, is elevated, glistening, and of a yellowish-pink color. It is friable and surrounded by a hard ring. *Chan-*

FIG. 265.



Epithelioma of the cervical portion of the uterus, developed from the epithelium. (Gebhard.)

FIG. 266.



Adenoid carcinoma of the cervix, developed from the glands. (Gebhard.)

ceroid is an acute affection, with sharp edges and a yellow floor. *Chancre* has its history, is very soon accompanied by adenitis, and heals in short time under specific treatment. A *tuberculous ulcer* is surrounded by miliary tubercles, contains the bacillus tuberculosis, and is generally associated with pulmonary tuberculosis. *Friction ulcers* on the inverted vagina and prolapsed cervix are bluish and heal promptly under local treatment. The lymphatic glands are not

swollen. *Corroding ulcer* can be distinguished only by microscopical examination, there being no proliferation of epithelial cells. *Papil-*

lomas have a narrow base, while carcinomatous papillary growths have a broad one.

Carcinoma of the body must be distinguished from hyperplastic endometritis, myoma, and products of conception. In *hyperplastic endometritis* there is no tumor and no breaking-down, while in carcinoma portions of the neoplasm may be expelled. The microscopical examination of scrapings shows a different composition. In fungoid endometritis the single epithelial layer of the glands is unbroken, while in carcinoma there are atypic epithelial pegs. *Myoma* grows very slowly and does not produce cachexia. The patient may be pale from loss of blood, but she has not the yellowish color. No particles are broken off and expelled. A *placental* or *decidual polypus* is recognized by its microscopic structure. The distinction from *sarcoma* can likewise be made only with the microscope; and if it has no influence on the treatment, it is of importance so far that the prognosis of hysterectomy is somewhat better in sarcoma.

Pain is an unreliable symptom: it may be absent in cancer and present in other diseases. A malodorous, purulent discharge may be due to simple endometritis. If there is any doubt in regard to the benignity of a tumor or an ulcer, a microscopical examination should be made. The material, when the cervix is affected, is obtained by cutting out after cocainization a small wedge of the cervix and uniting the edges by suture, and in suspected corporeal carcinoma, by curetting. If the tissue thus secured shows a carcinomatous structure, the diagnosis is certain; but a negative result does not exclude carcinoma. If a patient has repeated hemorrhages, and curetting gives a negative result, the posterior wall of the cervix should be incised (Fig. 206, p. 241) and the internal os dilated till it admits the forefinger and allows the surgeon to palpate the whole cavity of the uterus.

A forgotten *sponge* may cause hemorrhage and simulate a carcinomatous cervix, but by vaginal examination and use of the speculum the diagnosis is easily made. If, unfortunately, a pregnant uterus has been subjected to curettage, the scrapings may show villi of the chorion, which are characteristic, or a portion of the endometrium. This—the decidua—is composed of large polyhedral cells, with a large nucleus, but these are only the interglandular cells tightly packed together. The glands tend towards a triangular form. Their epithelium is flattened but distributed regularly (Fig. 184, p. 220).

While the diagnosis of carcinoma is difficult in the beginning, later it becomes easy, the chief features being frequent, profuse hem-

orrhage; watery, offensive discharge; great pain; cachexia; a friable tumor hanging from the cervix, or a crater-like ulcer, surrounded by hard walls; immobility of the uterus, and implication of neighboring organs.

Prognosis.—Left to itself the disease ends in death within a few years. Early operation may exceptionally result in permanent recovery.

Treatment.—*Prophylaxis.*—A lacerated cervix with ectropium should be repaired and endometritis and erosions treated with astringents, cauterization, and curetting.

Curative Treatment.—At present there is only one remedy that holds out any hope of a radical cure,—namely, total hysterectomy, which should be resorted to even if only a small portion of the organ is affected and if there is a possibility of removing all diseased tissue. In cases in which the degeneration is still limited to the uterus,

FIG. 267.



Bernays's uterotractor.

this may be done by vaginal section; but as the surrounding connective tissue and lymphatic vessels and glands are soon implicated, most operators prefer the abdominal route, which allows them to remove much of the broad ligament and infiltrated pelvic glands.

In order to avoid infection of the wound in vaginal hysterectomy, it is often performed by means of the thermo- or galvano-cautery, and in the abdominal operation the cervix may be severed and extirpated from below. The cervix being often very brittle, common traction-forceps are apt to tear out. In such cases Bernays's uterotractor (Fig. 267) has proved very useful in the author's hands.

The ovaries being apt to be drawn into the carcinomatous process, the appendages ought always to be removed.

The *modus operandi* in hysterectomy is described under *Myoma* (pp. 277-289).

If the disease is so far advanced that the uterus cannot be extirpated, our resources are limited to palliative operations and medical

treatment. In corporeal carcinoma, prolongation of life and temporary arrest of hemorrhage may be gained by curetting; but the danger of perforating the uterus must be taken into consideration. If the carcinoma is situated in the cervix, the curettage may to advantage be done with Thomas's spoon-saw, and is usually followed up with cauterization with the thermo- or galvano-cautery. Whether the cautery be employed or not, the cervix and vagina are packed with iodoform gauze. This tampon remains undisturbed 5 or 6 days, and after that the cavity is painted with tincture of iodine every 2 or 3 days. No vaginal douches are used. By this dry treatment the shrinkage of the cervix is so great that a semblance of an os is formed, and the disease is hardly recognizable. Nobody should undertake curetting for cancer who is not prepared to ligate the uterine arteries or even to perform vaginal hysterectomy.

The indications for medical treatment are to combat pain, hemorrhage, and odor. Large doses of opiates are required. Astringent and antiseptic vaginal injections are used. Suppositories with chloral and tannin (ää gr. xv-3ss—from 1 to 2 grammes) fill all three indications. Occasionally the application of a hæmostatic tampon may be necessary.

No drug cures cancer. Perhaps Finsen rays, Röntgen rays, and the local influence of radium will prove more valuable, either alone or as after-treatment after operative procedures. Injection of $\frac{1}{2}$ grain bichloride of mercury into the tissue three times a week retards the extension of the disease and cleans ulcers.

F. ENDOTHELIOMA.—Some malignant uterine tumors originate in the endothelium of blood- and lymph-vessels, and are, therefore, called endotheliomas. Since there is no fundamental difference between endothelium and epithelium, they stand near carcinoma, even pathologically, and cannot be distinguished from it clinically.

G. PAPILLOMA.—Most papillary growths are carcinomatous, sarcomatous, or myomatous. True papilloma is a benign tumor, due to hypertrophy of the papillæ of the mucous membrane of the vaginal portion, or rarely the body, of the uterus. It gives rise to hemorrhage and watery discharge.

Treatment.—If it springs from the vaginal portion, this should be amputated. In the body it is curetted and cauterized.

II. TUBERCULOSIS.—Next to the tubes, the uterus is the portion of the genital tract most frequently affected by tuberculosis. It is nearly always limited to the corpus. Tuberculous ulcers of the vaginal

portion are very rare and not combined with corporeal tuberculosis. Uterine tuberculosis may be *primary* or *secondary*, the latter spreading from neighboring organs or being brought from other portions of the body with the blood. The disease is generally confined to the mucous membrane. It occurs in three forms: the *acute miliary*, the *chronic diffuse*, and the *chronic fibrous* varieties, of which the chronic diffuse is by far the most common. It is characterized by the production of cheesy masses.

The *symptoms* are those of endometritis. The uterus is enlarged and knobs may be felt near the cornua. Cheesy masses may be expelled; or, if there is an occlusion of the cervix, pyometra may develop. As a rule, tuberculosis is also found in the tubes and the lungs.

Diagnosis.—Scrapings removed with the curette show small round-cell infiltration, giant cells, and tubercle bacilli. The tuberculous ulcer of the vaginal portion resembles a *carcinomatous*, but the diagnosis is made by cutting out a small piece of the tissue, which, in carcinoma, is composed of epithelial cells.

Treatment.—The general treatment is the same as for tuberculosis in any other organ (p. 138). The local treatment consists in curettage, the application of iodoform or xeroform, and, if the patient's general condition warrants it, total hysterectomy, inclusive of removal of the appendages. In ulceration of the vaginal portion, Röntgen and Finsen rays should be tried.

Since the disappointment that followed the exaggerated expectations awakened in 1890 in regard to tuberculin, most general practitioners have lost all faith in culture products in the treatment of tuberculosis; but specialists who have large experience in treating this disease with and without this remedy have come to the conclusion that they obtain better results by using such products than without them. It is claimed that fresh miliary tubercles in the vulva disappear under their use. This remedy should, therefore, have a place in the treatment of the disease in this and other localities.¹

¹ Dr. Karl von Ruck, the director of the Winyah Sanitarium, in Asheville, N. C., has treated with culture products 1339 cases, 42.6 per cent. of which recovered, and 40.3 per cent. were improved, while of 816 cases in which he did not use them only 12.1 per cent. recovered and 31.0 per cent. were improved (*Jour. of Tuberculosis*, vol. v, No. 1, April, 1903). The dose has been made much smaller than in the beginning, and finer products have been obtained. Von Ruck's watery extract is entirely free from culture fluid, and is the most refined of all the culture products, and its efficiency has proven to be superior in the hands of all who have used it." (F. M. Pottenger, of Los Angeles, Cal., *Jour. of Tuberculosis*, April, 1902.)

CHAPTER V

DISEASES OF THE OVIDUCTS

§ 1. **Malformations.**¹—The oviducts, or Fallopian tubes, may occasionally have so wide a lumen that a uterine sound can pass through it. Intra-uterine injections should, therefore, always be administered with the patient lying on her back, and even then the cervical canal should be sufficiently dilated to insure free outflow, unless a double-current catheter be used.

The tubes may have from one to three *accessory abdominal ostia*, surrounded by fimbriæ. There may be also whole *accessory tubes*.

The oviduct may be totally or partially *absent* on one or both sides, or be a *solid* column without lumen,—abnormalities due to arrest of development. These defects may be the cause of dysmenorrhœa and local peritonitis, when ova and blood from the ruptured Graafian follicles fall into the peritoneal cavity.

At the fimbriated end of the tube is often found a little cyst—the *hydatid of Morgagni*. It is without clinical importance.

§ 2. **Salpingitis.**—Salpingitis is the inflammation of the oviduct, the Greek name for which is *salpinx*, a trumpet.

Classification.—The inflammation may be limited to the mucous membrane—*endosalpingitis*; or chiefly attack the muscular coat—*interstitial salpingitis*; or be situated in the peritoneal cover—*perisalpingitis*. Endosalpingitis may be *catarrhal* or *purulent*, both *acute* processes, while interstitial salpingitis is *chronic*. *Profluent salpingitis* is a variety in which fluid—watery, bloody, or purulent—is discharged from the tube through the uterus and vagina. *Salpingitis isthmica nodosa* is another variety, characterized by the formation of hard tumors in the uterine portion of the tube. Salpingitis may be *non-infectious* or *infectious*. The former is catarrhal, the latter purulent, but may begin or end as catarrhal.

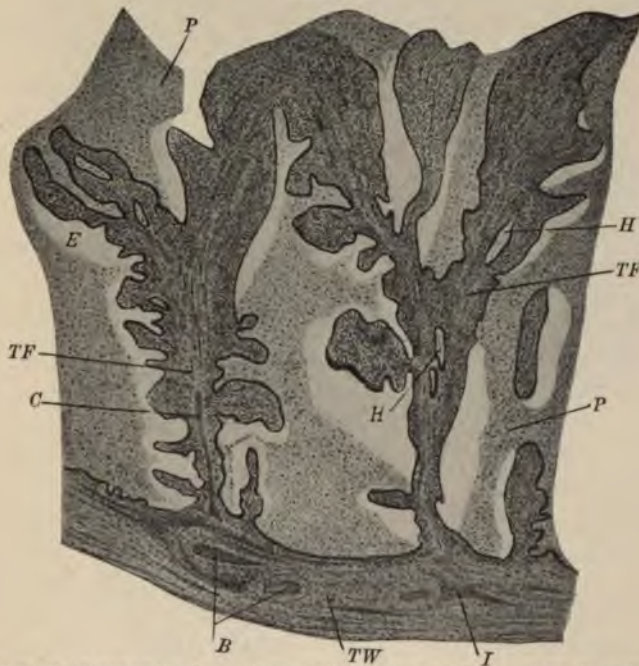
Pathological Anatomy.—One or both oviducts may be inflamed. The infectious form is generally bilateral. The tube swells to the size of the little finger or the thumb. The catarrhal salpingitis is chiefly limited to the mucous membrane, which is red and swollen. Lateral branches grow out from the folds, and these branches, as well

¹ Garrigues, "Malformations of the Female Genitals," *Mann's System of Gynecol.*, 1887. Philadelphia, Lea.

as the original folds, become œdematous and may coalesce, forming closed cavities—pseudocysts. The secretion is increased.

In the purulent variety the inflammation goes deeper. The connective tissue between the muscle-bundles is infiltrated (Fig. 268). As a rule, the process starts from the mucous membrane, but probably the infiltration may come also from a tear of the cervix and pelvic cellulitis, through the lymph-vessels. The fimbriæ become agglutinated among

FIG. 268.



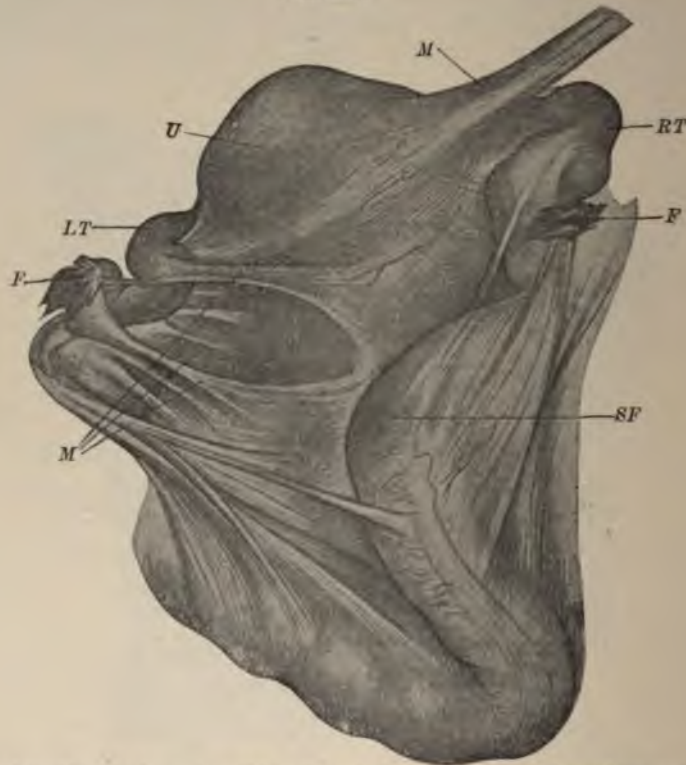
Section of wall of gonorrhoeal pyosalpinx. (Kleinnans.) *TW*, muscular tube-wall, thinned and interspersed with streaks of infiltrated round cells (*I*) and blood-vessels (*B*). The tubal folds (*TF*) high, the section tree-like, giving the picture of so-called vegetative salpingitis. The lumen filled with pus (*P*). The epithelium (*E*) preserved, in some places ciliated. *C*, capillaries in the folds; *H, H*, hollow spaces.

themselves or to the ovary, so that the abdominal ostium becomes closed. Later the uterine ostium may likewise be occluded. The tube becomes enlarged, distorted, and often bound by adhesions to neighboring organs (Fig. 269).

At a certain period gonococci or pyogenic streptococci and staphylococci are found in the purulent variety; but these being killed by their own productions, the pus later becomes sterile.

In interstitial salpingitis the intermuscular connective tissue becomes infiltrated and the muscle-bundles themselves break down to inflammatory corpuscles. This process may end in hypertrophy (Fig. 270) or atrophy.

FIG. 269.



Perisalpingitic adhesions. (Zweifel.) *U*, fundus uteri; *M*, peritoneal membranes and cords; *RT*, right tube; *LT*, left tube; both bent and kinked; *F*, fimbriae; *SF*, sigmoid flexure. The ovaries all covered with false membranes.

The different kinds of salpingitis may be found in the same case (Fig. 271).

When both ends of the tube are impervious, the fluid accumulates. It may be serous, mucous, pultaceous, purulent, or bloody; and a cyst is formed, a condition which will be considered later. The wall is thickened in some places and attenuated in others, where a rupture may occur, in consequence of which the fluid enters into the abdominal cavity or, in rarer instances, is retained between the layers of the broad ligament.

Frequency.—Salpingitis is a common disease.

Etiology.—It is rarely *primary*. Generally it is *secondary* after metritis or peritonitis. From the uterus it may either expand along the mucous membrane by continuity or pass through the lymphatics. In most cases it is due to infection, either gonorrhœal or puerperal, brought about by the invasion of gonococci, streptococci, staphylococci, or rarer microbes. An irregular course of the tube predisposes to it. It arises in infectious and exanthematous diseases, such as cholera, typhoid fever, scarlet fever, and smallpox. It may accompany myoma, carcinoma, flexion of the uterus, or ovarian disease. The cause may be exposure to cold, venereal excesses, or violent exercise. Sometimes it is the effect of operations with unclean instruments, even the mere introduction of a sound.

Symptoms.—Salpingitis, even in its most dangerous—the purulent—form, may exist without giving rise to any symptom except recurrent fever and emaciation. Sometimes there is an intermittent discharge of pus from the uterus, but this may be due to endometritis. The pain may have a peculiar colicky character, but that may be situated also in the uterus. It is increased by exertion, so that the patient becomes an invalid, incapable of doing any work. The other symptoms—leucorrhœa, menorrhagia, metrorrhagia, or amenorrhœa—are like those of uterine disease. By vaginal examination the tubes are felt swollen, tender, often distorted, and frequently adherent. In most cases the ovary is implicated or all the organs in the pelvis may be matted together to one mass, simulating a tumor.

Diagnosis.—Salpingitis being only a part of a more extended inflammation, may be difficult to diagnosticate. One of the most characteristic signs is the intermittent expulsion of pus preceded by a burning pain in the iliac fossa, especially if it can be produced by stroking the tubes in the direction of the uterus. In *oophoralgia* the pain is determined by pressure on the skin over the side of the pelvic cavity, not by palpating the tube from the vagina, and there is no swelling.

FIG. 270.



Hypertrophy of Fallopian tube due to interstitial salpingitis. (Author's case.) The tube is cut open, showing the lumen (a) in the middle of the thick wall (b).

Oophoritis gives rise to a more oval tumor, situated farther backward. *Cellulitis* forms a swelling situated lower than the tube. *Pelvic peritonitis* causes, as a rule, a larger tumor, extending from Douglas's pouch to one of the iliac fossæ. A knuckle of the small intestine may be taken for the swollen tube, but is not so sensitive; and the diagnosis may be made when by repeated examinations it is not found in the same place and is alternately full or empty. Examination under anæsthesia may be necessary to make a diagnosis. If

FIG. 271.



Different varieties of salpingitis in the same patient. 1. Left tube cut open, catarrhal and interstitial salpingitis. *a*, closed fimbriae; *ab*, *ac*, thickness of wall; *d*, central cavity. 2. Right tube cut open pyosalpinx: *a*, closed fimbriae; *b*, cavity filled with pus; *c*, *c*, smaller cavities communicating with central canal. 3. Small, round body found loose in pelvic cavity, probably atrophied right ovary. (Author's case.)

there is a history of gonorrhœa, childbirth, or abortion, the salpingitis is in all likelihood purulent.

Prognosis.—Catarrhal salpingitis is less serious and more amenable to treatment; but the purulent variety is a dangerous disease, which may end fatally or entail invalidism and require perilous operations.

Treatment.—The *prophylaxis* consists in proper dress; avoidance of exposure, especially during menstruation; abstinence from sexual

intercourse at the period ; aseptic and antiseptic obstetrics ; and preservation from gonorrhœal infection.

If salpingitis is present, the physician should regard it as a counter-indication for the use of the sound, the curette, or intra-uterine injections, or for incisions in the cervix, as all these interferences may make the condition worse or even cause death.

Curative Treatment.—*Acute* salpingitis is treated with rest in bed, fluid diet, an ice-bag on the abdomen, hot vaginal and rectal injections, warm sitz baths, a saline aperient, and opiates. If it is the purulent variety and gives rise to serious symptoms, it may be wise to extirpate one or both tubes, and, perhaps, the uterus, too, in order to save the patient's life. This applies particularly to the septic form. Even if peritonitis develops, it never becomes general in the gonorrhœal variety.

In *chronic* salpingitis much may be accomplished by a palliative treatment, if the patient can take care of herself. It is often well also in this variety to begin with rest in bed for three or four weeks. Hot vaginal douches, warm baths, painting with iodine on the iliac region and the vaginal roof, pledgets with glycerin and ichthyol or iodide of potassium, galvanism, scarification of the vaginal portion, fly-blisters, warm poultices, hot-water bags, or Priessnitz's compress should be used for a long time. Superficial application of the thermocautery may act as a powerful revulsive. At the same time the general health should be improved with nourishing foods, mild stimulants, and tonics. Curetting and drainage with iodoform gauze are quite useful in milder cases.

If treatment on these lines is followed for four months or longer without satisfactory result, the tube may be subjected to direct surgical treatment from the vagina or the abdomen.

Catheterization of the oviduct is in normal and most pathological cases impossible. *Aspiration* should be limited to cases in which the tube is situated low and adherent to Douglas's pouch ; and even if the interference under these circumstances is safe, it is likely to be only of transient value, new fluid being reproduced.

A vaginal *incision* is much more satisfactory, but restricted to the same conditions as aspiration. It is particularly indicated in puerperal cases, if the patient is too weak for more radical measures. Posterior colpotomy is performed and the tube is punctured and torn with the expanding perforator. The cavity is packed with iodoform gauze, or a soft-rubber drainage-tube, with cross-bar and long enough to protrude from the vulva, is left in it. A safety-pin is inserted in

the lower end, and both are wound with iodoform gauze, so as to close the rubber tube without preventing drainage.

Sometimes it may be possible to reach the tube without entering the peritoneal cavity by making the incision hug the side of the cervix and separating the two layers of the broad ligament with the forefinger and then plunging the perforator into the tubal abscess.

Through posterior colpotomy the appendages may also be drawn into the vagina and either removed or treated in a conservative way; but for this purpose most operators prefer anterior colpotomy (p. 252), because it gives more room and leads more directly to the appendages.

Conservative Treatment.—The tubes forming the connecting links between the ovaries, where the eggs are created, and the uterus, where they are hatched, every effort should be used to preserve and restore their permeability, which principle may be carried even so far as to make it justifiable to gain access to them for the mere purpose of conquering sterility when all causes of this other than blocking of the passage through the tubes can reasonably be excluded. These conservative operations are nowadays mostly performed through the vagina, where the safety is greater than by abdominal section. The fimbriæ may be separated and stitched to the peritoneum in the neighborhood of the ovary. The fimbriated end may be cut off, when the mucous membrane bulges out and surrounds the canal. A probe may be run through this, and it may be washed out with a mild solution of bichloride of mercury (1 : 5000). In cases of cystic salpingitis the dilated part is cut off and the inner, normal portion allowed to remain. By tying the mesosalpinx without interfering with the arteries leading to the ovary, this may be spared, although the former is sacrificed.

If the ovary is diseased, too, that also may be saved by a conservative operation. If not, both tube and ovary are removed together by *salpingo-oöphorectomy*, which will be described in the next chapter. In acute salpingitis this is indicated only in the septic form, if it spreads to the peritoneum and threatens life. In the chronic interstitial variety it may be done to relieve suffering. Most cases of cystic salpingitis demand it.

If the uterus is inflamed, too, it should be curetted and drained; but if both appendages are so seriously diseased that they must be removed, it is better to extirpate the uterus at the same time.

CYSTIC SALPINGITIS.—When the ends of the oviduct are closed, a

considerable amount of fluid may collect in it and distend it. Thus cysts may be developed varying in size from a pear to a cocoanut. They may extend up into the peritoneal cavity or down between the layers of the broad ligaments. The contents vary much. If it is watery, mucous, or pultaceous, the condition is called *hydrosalpinx*; if purulent, the disease is termed *pyosalpinx*, and if bloody, the cyst is designated *hæmatosalpinx*.

Symptoms.—To the symptoms of common salpingitis are added others due to pressure—pain, constipation, meteorism, and dysuria. Sometimes there is a constant bloody discharge from the uterus. Cystic salpingitis generally gives rise to peritonitis with formation of wide-spread adhesions. A tumor is felt by bimanual examination on one or both sides of the uterus. It is mostly fluctuating, sometimes mobile, but more often immovable. It is globular, oval, club-shaped, with a narrower inner portion, or like a string of sausages. The uterus may be crowded to the opposite side.

The *diagnosis* may be difficult or impossible. In *tubal pregnancy* there is also a globular or oval tumor attached to the cornu of the uterus, but then there are amenorrhœa and other signs of pregnancy, sometimes irregular hemorrhages, attacks of violent pain, and expulsion of decidual shreds* from the uterus. *Ovarian cysts* can hardly be distinguished from tubal, unless the ovary can be felt besides the cystic tube. *Cysts of the broad ligament* are immovable, much less painful, and not sensitive. *Peritonitic exudation* is less defined, is immovable, causes more pain, and crowds the uterus forward. A *uterine myoma* is harder and the uterine cavity is deeper. A *fibrocyst* is in more intimate connection with the uterus, and the uterus is enlarged. Swollen *pelvic glands* are immovable and harder.

The differential diagnosis between the three varieties may also be obscure. Pyosalpinx is by far the most common and usually the result of gonorrhœal or puerperal infection. Hæmatosalpinx is the rarest, is sometimes accompanied by bloody discharge from the uterus, and is often unilateral, while pyo- and hydro-salpinx are generally bilateral. The latter is apt to form larger tumors (Fig. 272).

Treatment.—As a rule, the cystic tube is removed. If a *pyosalpinx* is *adherent* to the abdominal wall, an incision is made parallel to and above Poupart's ligament; and, if possible, a counteropening is made in the vagina and a rubber drainage-tube with side-holes drawn through. In cases of large *double pyosalpinx*, the best is to begin with vaginal hysterectomy, and either remove the appendages, if fea-

ible, or incise and drain the tubes. Some prefer the abdominal route. Then it is well to aspirate the pus and clamp the opening before trying to separate the sac, and the peritoneal cavity should be protected against contamination with gauze pads. If pus escapes in small

FIG. 272.



Large hydrosalpinx removed by laparotomy.
(Author's case.)

quantity, it should be wiped off, the place swabbed with peroxide of hydrogen, and the cavity drained; but if a large amount bathes the abdominal organs, the cavity should be flooded with normal salt solution.

Hydrosalpinx is generally removed by laparotomy.

Hæmatosalpinx may be incised from the vagina, the tube cleaned and allowed to remain. If it is operated on by laparotomy, the tube is removed; or if this is not practicable, it is cleaned, drained to the vagina, and the peritoneal wound closed.

§ 3. Displacements.—The tube may be found in an inguinal, crural, or obturator hernia or in the inverted uterus.

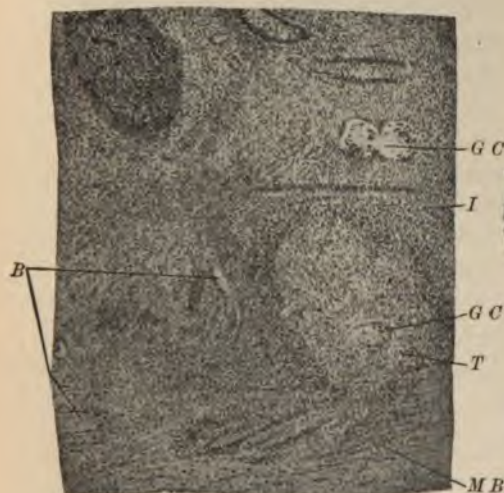
§ 4. Neoplasms.—Most neoplasms of the tube are of little practical interest, since they cannot be diagnosticated, are small, or combined with more important affections. TUBERCULOSIS constitutes, however, an exception. The tube is the favorite locality of the disease when it affects the genitals. It may be *primary* or *secondary*. The former is rare and probably due to infection through the semen of a tuberculous man. The latter is propagated by continuity from tuberculous peritonitis or brought with the blood current in women suffering from pulmonary phthisis.

The wall of the tube is swollen, the ostia are generally sealed, and the enlarged lumen filled with a cheesy mass. The mucous membrane is particularly attacked, and may be all destroyed; but the infiltration may penetrate the muscular coat (Fig. 273), and the peritoneum may be studded with miliary tubercles (Fig. 274).

The microscope shows nuclei clustering around giant cells and bacillus tuberculosis in the tissue and the secretion. The tubes are displaced and contorted and may form tumors as large as goose-eggs. Frequently these have the shape of a string of from three to five hard beads. Often the tubes, the ovaries, and the uterus are all matted together.

The *symptoms* are the same as in other tubal inflammations.

FIG. 273.



Section through wall of a tuberculous tube. (Kleinhans.) The disease has penetrated nearly the whole wall. The mucous membrane is changed to a pultaceous mass. *B*, blood-vessels; *MB*, muscle-bundles separated; *I*, infiltration; *GC*, giant cells; *T*, tubercle.

FIG. 274.



Tuberculous tube, $\frac{3}{4}$ natural size. (Kleinhans.) Tube circumscribed. Serous coat studded with miliary tubercles (*ST*); fimbriae red and swollen (*F*). *I*, isthmus of tube.

The *diagnosis* may be difficult. It is chiefly based on the presence of tuberculous ulcers in the external genitals, expulsion of caseous masses from the uterus, or removal of tuberculous tissue with the curette from its wall. The tuberculous nature of the tubal disease may be inferred from the presence of the affection in other organs and hereditary disposition. *Common pyosalpinx* usually leaves the inner portion free, while tuberculosis has a predilection for the isthmus portion of the tube, and even attacks the intramural part. In *pyosalpinx* the tumor may also be composed of beads; but these are soft, whereas in tuberculosis they are hard.

Prognosis.—In very exceptional cases the disease may end in spontaneous recovery. As a rule, the prognosis is bad.

Treatment.—If the general condition of the patient warrants it, and the operation is practicable, the extirpation of both appendages and the uterus, too, should be performed; but on account of the adhesions this may not be feasible. The general treatment is the same as for tuberculosis in other organs (see pp. 138, 303).

CHAPTER VI

DISEASES OF THE OVARIES

§ 1. **Malformations.**¹—*Supernumerary Ovaries.*—In a unique case were found three large ovaries, each connected with the uterus with an ovarian ligament. An ovary may be more or less completely divided into two parts by fissures. Small bodies of the size of a pea and composed of ovarian tissue are often seen at the peritoneal border of the normal ovary. These facts may explain the not unfrequent continuation of menstruation after oöphorectomy and the occurrence of pregnancy after double ovariectomy.

Absence or Rudimentary Development.—The ovaries may be totally absent or, more frequently, rudimentary. In the latter case they may contain Graafian follicles or not. Women without follicles do not menstruate, and are, of course, sterile, but may have sexual desire and a perfect female type.

§ 2. **Foreign Bodies.**—A sewing-needle has been found in the ovary, which it may have reached after long wanderings through the tissues of the body or more directly by being swallowed and penetrating from the intestine. A darning-needle found partially in the uterus and partly in the ovary had probably been introduced into the uterus in order to provoke abortion.

The foreign body causes pain and inflammation and should be removed. If a portion of it is felt in the uterus, the cervix should be dilated and the needle grasped with forceps. If it is entirely embedded in the ovary, it cannot be diagnosticated. The ovary may be reached through anterior colpotomy or laparotomy, and cut open and the needle extracted. If it has given rise to an abscess, the organ should be removed.

§ 3. **Displacements.**—An ovary may become disconnected with the uterus and broad ligament, and either float in the abdominal cavity or become adherent. Even retaining its mooring-point, it may be displaced either outside or inside of the pelvis.

HERNIA OF THE OVARY.—It may, in rare cases, be found in a hernia, especially of the inguinal, crural, obturator, or ventral variety; or it may by an arrest of development remain in the lumbar region. In

¹ Garrigues, "Malformations of the Female Genitals," *System of Gynecol.*, edited by Mann, 1887, Phila., Lea, vol. i., p. 236.

guinal hernia may be congenital or acquired. The congenital cannot be replaced. It may be protected by a hollow pad, or, if it inconveniences the patient, it may be extirpated. The acquired may, perhaps, be replaced and kept in by a truss or the radical operation for hernia. If it cannot pass the canal, herniotomy should be performed; but if the ovary is diseased, it is better to remove it.

The same principles apply to crural hernia, which is always acquired.

The ovary may be found in a ventral hernia following laparotomy, and is then an indication for reopening the cicatrix and attempting a better union of the aponeurosis.

PROLAPSE OF THE OVARY.—In contradistinction to the extra-pelvic displacements, which are rare occurrences, the intrapelvic prolapse is common. The ovary then describes an arc, the attachment of the ovarian ligament acting as the centre, and sinks downward, inward, and backward, first to the retro-ovarian shelf and then into Douglas's pouch.

Etiology.—The left ovary is much more frequently prolapsed than the right. This may be attributed to the absence of a valve in the ovarian vein on this side, its opening into the renal vein under a right angle,—which favors stasis of blood,—and the presence of the rectum, hard scybala in which may exercise a direct pressure on the ovary. Increase in weight and size of this organ may cause it to sink down. Insufficient support from the pelvic floor has a similar effect. Flexion of the uterus, especially retroflexion, drags it along. Pregnancy stretches and loosens its connections. Hyperæmia caused by prolonged sexual excitement, inflammation, or cystic degeneration may all lead to prolapse.

We have seen above that the ovaries may be dragged also into an inverted uterus.

Symptoms.—The patient complains of pain in the sides of the pelvis, the sacral region, or the rectum, or one shooting down to the knee or up into the hip. It increases by exertion and often by the sitting posture. Palpation of the ovary is also very painful. The patient suffers more at the periods, which frequently are too profuse. She is despondent and irritable. Sometimes she is nauseated and vomits.

The *diagnosis* is easily made by bimanual examination, or, if the ovary is situated high and the patient is fat, in the lateral position.

Prognosis.—The prolapsed ovary is liable to become inflamed or cystic.

Treatment.—The indications are twofold: to combat hyperæmia or inflammation and to replace the ovary and keep it in its proper position. The first is met by the usual antiphlogistic measures—hot douches, painting with tincture of iodide, ichthyol glycerin tampons, scarification of the vaginal portion, or the galvanic current, with the positive pole placed against the vault of the vagina on the affected side. It is also well to let the patient daily pass a little while in the knee-chest position, admitting air to the vagina. If the ovary is adherent, the adhesions may, perhaps, be stretched and absorbed by packing the vagina or by massage.

If the uterus is retroflexed, it should be replaced and kept up by a pessary or an operation. If there is no uterine displacement, the ovary is replaced and a pessary applied. Thomas's retroflexion pessary sometimes works well. If the ovary is too tender to stand the pressure of a hard body, a pessary of whalebone, covered with soft rubber, or one especially made for the case, with a notch in the middle or a corner cut off, may be tried. The infundibulopelvic ligament may be shortened, or the ovary stitched to the peritoneum in its normal position, which is in the true pelvis, near to the wall, slightly below the iliopectineal line, with the upper end near the ureter, where this enters the pelvis. If the ovary is diseased, it may be better to remove it by vaginal section.

§ 4. *Hyperæmia and Hæmatoma.*—A stasis of blood results doubtless from contraction of the layer of unstriated muscle-fibres spread out between the uterus, the tube, and the wall of the pelvis (Fig. 275).

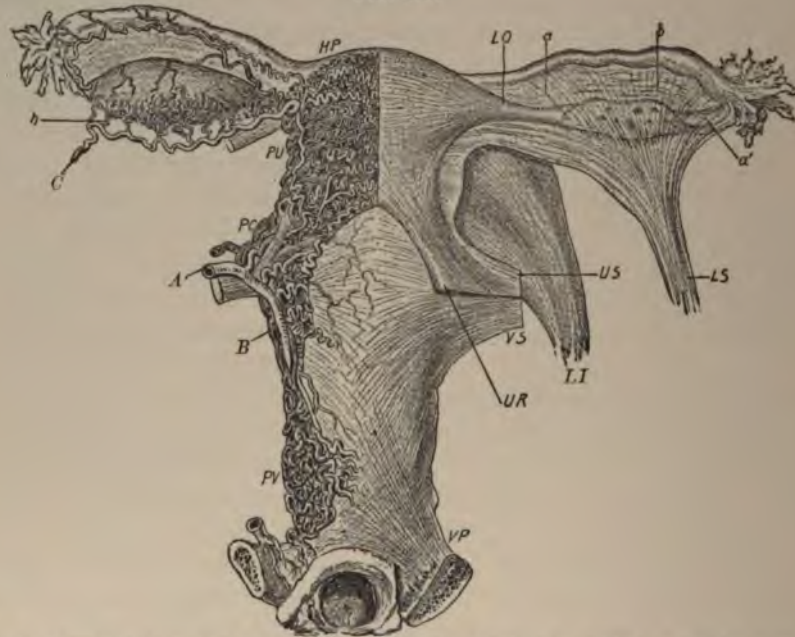
Such an engorgement in all probability takes place during copulation, and may contribute to the rupture of a Graafian follicle. A similar normal hyperæmia occurs also in connection with menstruation. In some women the ovaries can be felt much enlarged at this period.

HÆMATOMA.—Abnormal extravasation of blood may take place into the follicles or the stroma. The follicular hæmatoma is rarely larger than a hazel-nut (Fig. 276), that in the stroma may form a tumor as large as a fetal head at term. The sac may rupture and the blood escape into the peritoneal cavity or between the layers of the broad ligament. The blood may become inspissated or changed to a serous fluid or pus.

Etiology.—Hyperæmia and hæmatoma may be produced by venous stasis, which may be due to masturbation, venereal excesses, heart or

lung diseases, tumors compressing the veins, torsion of the ala vespertilionis, or sudden suppression of the menses. In a case operated on by the author a large hæmatoma of the ovary was caused by an imperforate uterus (Fig. 277).¹

FIG. 275.



The vessels of the vagina and the internal genitals in their relation to the superficial muscular structures. (Rouget.) The specimen is seen from behind. Vascular system: *A*, uterine artery; *B*, vaginal artery; *C*, ovarian artery; *PV*, vaginal plexus; *PC*, cervical plexus; *HP*, helicine arteries of uterine body; *h*, helicine arteries of the ovary. Muscular system: *PV*, insertion of the muscle-bundles of the vagina on the pubic bone; *VS*, bundles of the same muscular coat originating in the region of the sacro-iliac articulation; *US*, uterine muscle-bundles which accompany the preceding ones and constitute to a great extent the posterior layer of the broad ligament; *UR*, recto-uterine or sacro-uterine ligaments; *LI*, inguinal or pubic round ligament spreading over the whole anterior surface of the uterus; *LS*, superior or lumbar round ligament (including the infundibulopelvic ligament), which accompanies and envelops the internal spermatic, or ovarian, vessels; *a*, muscular bundles originating in the ovarian ligament, *LO*, and interlacing with the bundles, *b*, from the superior or lumbar ligament (*LS*), spreading in the interior of the ovary and the ala vespertilionis before they insert themselves on the tube and the fimbriae; *a'*, bundles originating in the ovary which, together with others detached from the superior round ligament, form the fimbria ovarica.

Hæmatoma may arise also from dissolution of the blood, such as supervenes in severe burns, phosphorous poisoning, typhoid fever, puerperal septicæmia, scurvy, etc.

¹ Garrigues, "Case of Atresia Vaginae, Imperforate Uterus, and Large Hæmatoma of Ovary," *Med. News*, Feb. 10, 1900.

Symptoms.—Hyperæmia determines pain, especially at the monthly period, extending down the inner side of the thighs. Sometimes the breasts swell and hurt. There is often menorrhagia.

Hæmatoma may be present without symptoms; but if large it produces pain, nausea, vomiting, and the ovary is felt enlarged. If rupture occurs, the usual symptoms of internal hæmorrhæge develop, such as abdominal pain, pallor, cold, clammy skin, fainting, gasping breath, and a small, rapid pulse. A large hæmatoma may be felt fluctuating by bimanual examination.

The *diagnosis* can sometimes be made if there is a sudden enlargement of the ovary without fever.

Prognosis.—Hyperæmia can, as a rule, be cured. Hæmatoma may be absorbed, but the danger of rupture must be borne in mind.

FIG. 276.



Follicular hæmatoma of the ovary (a little less than natural size). *a*, follicle, twelve millimetres in diameter, closed, containing fresh blood-clot; *b, b, b*, follicles with serous contents; *c*, tube. (Author's case.)

FIG. 277.



Large stromal hæmatoma of ovary, with imperforate uterus. (Author's case.) *a*, solid uterus, with cervix; *b*, right ovary, with ruptured Graafian follicle; *c*, right Fallopian tube, with part of the broad ligament; *d*, left tube distended; *e*, serous cyst; *f*, left ovary converted to a sac filled with inspissated blood.

Treatment.—*Acute hyperæmia* is combated by rest in bed, an ice-bag on the abdomen, a saline aperient, and an opiate.

Chronic hyperæmia should be treated with rest, sexual abstinence, scarification of the vaginal portion, fly-blisters in the iliac fossa, paint-

ing with tincture of iodine on the vaginal vault and the skin of the iliac fossa, tampons with ichthyol- or iodide-of-potassium-glycerin, hot douches, tonics, and bromides.

A small *hæmatoma* may yield to treatment similar to that of acute hyperæmia, but causes, perhaps, so much pain that salpingo-oöphorectomy is indicated. A large tumor calls likewise for removal of the ovary. At the appearance of signs of rupture into the abdomen this should be opened at once, and the ovary and tube of the affected side extirpated.

§ 5. **Oophoritis.**—Oophoritis, the inflammation of the ovary, may be *acute* or *chronic*.

A. ACUTE OOPHORITIS AND OVARIAN ABSCESS.—*Pathological Anatomy.*—The ovary is enlarged, impregnated with a reddish serum, and the cut surface shows yellow streaks which later blend and form an abscess. The inflammation may originate on the surface,—*peri-oöphoritis*,—which is like peritonitis, although the ovary is not covered with peritoneum, but has a columnar surface epithelium; or in the follicles—*follicular oophoritis*; or in the stroma—*interfollicular oophoritis*. Examined microscopically, the tissue is infiltrated with small round cells, which may change into pus corpuscles. In gonorrhœal or puerperal oophoritis usually both ovaries are inflamed, in other varieties generally only one is affected. There may be one or more abscesses in one ovary. The follicles may be destroyed. The inflammation may end in resolution, induration,—*cirrhosis*,—or suppuration. The abscess generally contains streptococci, staphylococci, or gonococci; but it may be produced also by bacterium coli commune or the pneumococcus.

Etiology.—Oophoritis may be *primary* or *secondary*. The *primary* may be due to hyperemia or a hæmatoma, the causes of which have been stated above. It may occur in constitutional diseases, such as eruptive fevers, cholera, septicæmia, and poisoning with phosphorus or arsenic. It may follow operations, such as curetting, trachelorrhaphy, or the mere use of the sound. The inflammation then commonly follows the mucous membrane of the uterus and the tubes, but it may reach the ovaries also through the lymphatics. *Secondary* oophoritis is mostly due to gonorrhœa, the gonococcus travelling along the mucous membrane of the genitals; or the inflammation spreads to the ovary by extension from the peritoneum.

Symptoms.—The symptoms are generally blended with those of the inflammation of other pelvic organs, particularly salpingitis or

peritonitis. Often the knee is drawn up on the affected side. The breasts may be painful, or the inflammation may alternate with mumps. The patient is feverish, and has nausea or vomits. By bimanual examination the enlarged and exquisitely sensitive ovary can sometimes be isolated. An ovarian abscess gives rise to repeated chills. Sometimes fluctuation can be felt. The abscess may rupture into the bowel, the bladder, the vagina, the peritoneal cavity, or through the abdominal wall.

Diagnosis.—In suppurating *ovarian cyst* the symptoms are less acute. In *salpingitis* and *pyosalpinx* the tumor is club-shaped, pear-shaped, or sausage-shaped, whereas the inflamed ovary and ovarian abscess are globular. *Pelvic abscess* is situated lower and is immobile, while the ovarian abscess may be movable.

Prognosis.—The non-septic inflammation rarely threatens life. It may subside in a few days, but it is liable to return. The septic variety often forms abscess. The rupture into the abdominal cavity is fatal; that into the hollow organs may heal up, but sometimes fistulous communications remain and exhaust the strength of the patient. Often oophoritis leads to sterility.

Treatment.—Acute oophoritis is treated, like hyperæmia, with rest in bed, ice-bag, saline aperients, an opiate, and hot douches.

If there is an abscess, in most cases salpingo-oöphorectomy should be performed by vaginal or abdominal section; but if the ovary is within easy reach, it is better to perform posterior colpotomy, puncture the ovary with the expanding dilator, and drain through the vagina.

B. CHRONIC OOPHORITIS.—Chronic oophoritis is characterized by the remains in and around the ovary of the products of acute inflammation and by repeated acute attacks.

Pathological Anatomy.—The ovary is generally two or three times its normal size, and is oval or globular; but in other cases it is atrophic. Frequently it is more or less cystic. Fig. 278 shows such an ovary filled with minute cysts. The ova are often diseased or destroyed. In other cases a single cyst may acquire the size of an English walnut. Sometimes this is developed from a corpus luteum (Fig. 279). The cystic degeneration is probably due to hyperæmia at the menstrual periods, the follicles being prevented from rupturing by false membranes covering the ovary or by its deep seat in the stroma.

Etiology.—The chronic variety often begins as the acute, or is produced by hyperæmia or hæmatoma. Prolapse of the ovary or

retroflexion of the uterus frequently lead to it. It is in many cases combined with a cyst of the other ovary. It is mostly due to gonorrhœal or puerperal infection. Other factors instrumental in its

FIG. 278.



Chronic oophoritis with small cystic degeneration (natural size). (Author's case.)

appearance are masturbation, venereal excesses, assiduous work with the sewing-machine, alcoholism, and syphilis.

Symptoms.—These are frequently merged in those of salpingitis and local peritonitis or of retroflexion of the womb. Generally the affection is bilateral. There is pain in the iliac fossæ, backache, sometimes neuralgia of the thighs. The pain becomes worse at the approach of the menstrual period, by physical exertion, and by copulation. Some patients can hardly walk or stand for any length of time. Menstruation is too profuse, or may later cease altogether.

Primary or secondary sterility is common. A woman with chronic oophoritis, who must work for a living, suffers terribly, and wealthy ladies may through it be invalids, passing most of the time in bed or on a lounge. Leucorrhœa is common. The digestive powers are impaired and malnutrition follows. The nervous system is disordered, which may result in hysteria or hystero-epilepsy.

Diagnosis.—Sometimes it is impossible to tell whether a mass felt in the side of the pelvis is the ovary or the tube, or both matted together by adhesions; but in other cases one can isolate the enlarged ovary as an oval or globular body, situated more backward; while salpingitis forms a sausage-shaped tumor, nearer to the uterus and placed more forward. Often the ovary is prolapsed. The inflamed ovary is more sensitive than any other pelvic organ. The ovaries, or one of them, increase in size before each menstruation. The ovarian antemenstrual pain begins

FIG. 279.



Chronic oophoritis, natural size. *a*, corpus luteum changed to a cyst; *b*, yellow masses with remnant of central cavity; *c*, *c'*, corpora nigra; *d*, thickened albuginea. (Author's case.)

often eight or ten days before the flow, whereby it is distinguished from that dysmenorrhœa which begins with and often accompanies uterine disease.

Prognosis.—Chronic oophoritis is a serious disease. It rarely leads to death by the formation and rupture of an abscess, but it may last for many months or years, and does not often end in perfect recovery. It frequently makes the patient sterile, and has a bad influence on the general health.

Treatment.—The antiphlogistic treatment is the same that we have described for chronic salpingitis (p. 309). The galvanic current with the positive pole applied to the roof of the vagina is very effective in reducing the size of the ovary and combating all other symptoms. If pain is a more prominent symptom than exudation, the high-tension faradic current gives still better results. The medicinal treatment consists chiefly in administration of tonics. Bromides are useful in soothing the irritated nerves. Chloride of gold, bichloride of mercury, and drugs containing iodine may reduce the swelling. Desiccated parotid gland of sheep (3 to 6 tablets daily, each containing 2 grains of the dried gland) is said to have a specific effect on the ovary. Friction with chloroform liniment gives temporary relief from backache. A warm entire bath should be taken twice a week. Sea baths in season are strengthening. The iodine water of Kreutznach, and the mineral-mud baths at Franzensbad, Marienbad, or Schwalbach have often a good effect. The Kreutznach cure may be imitated here (p. 76).

Conservative operations may be performed on the ovary as well as the tubes, access being gained through laparotomy or colpotomy. The ovary may be split lengthwise and cysts enucleated, or a wedge may be cut out. The organ is closed with a running suture of catgut. With medicinal, electric, and conservative surgical treatment the cases have become rare in which ablation is resorted to. If the ovary has to be removed, the tube, that would be useless and is so apt to become diseased, is taken away too by the operation known as *salpingo-oöphorectomy*. This may be performed by abdominal or vaginal section.

(a) *Abdominal Salpingo-oöphorectomy.*—The incision is usually made in the median line (p. 282). Its lower end is half an inch above the symphysis, the upper varies according to circumstances. In easy cases an incision admitting two fingers is sufficient, but mostly the whole pelvic cavity must be made visible and accessible, for which an incision allowing the passage of the fist is needed. Under such

circumstances the transverse incision (p. 287) is particularly valuable, as it makes it much easier to work in the sides of the pelvis. If the small longitudinal section is made, the fore- and middle fingers of the left hand are introduced into the peritoneal cavity, push the omentum and small intestine out of the way, advance to the fundus uteri, and follow it and the tube out to the side until the ovary is felt, when both are drawn outside the wound, which may be facilitated by packing the vagina beforehand and raising the pelvis. If there are adhesions, they are cautiously torn, the surgeon relying on his sense of touch alone. If this meets with difficulty or there ensues any hemorrhage, the incision must be enlarged until the pelvic cavity can be inspected and all portions of it reached. For this purpose the intestines are made to gravitate towards the diaphragm by raising the pelvis and are kept out of the way by large pads. Vascular bands are cut between two ligatures. When the appendages are brought out, a catgut ligature is passed with Schroeder's needle or ligature-carrier from $\frac{1}{2}$ to $\frac{3}{4}$ inch below the ovary; the ligature is seized and cut in the middle; the two halves are crossed, so as to form interlocking rings, and one half is tied outside the tube and ovary and the other inside, close to the uterus. Next, the pedicle is seized with two pairs of forceps and severed. The single arteries are picked out on the cut surface and tied separately, and the stump is covered with iodoform or aristol, or the peritoneum or a piece of Cargyle vellum is stitched over it in order to prevent adhesion to the intestine. Great care should be taken to leave a sufficiently large button of tissue beyond the ligature to prevent slipping. If there is any bleeding from the cut surface, one of the ligatures is carried around the whole pedicle and tied below the first. When the pedicle is safe in every respect, it is dropped.

Instead of thus including a large portion of the broad ligament in the pedicle, it is better to pass separate ligatures, one in the infundibulopelvic ligament around the ovarian vessels and one inside around the tube, ovarian ligament, and the utero-ovarian artery. In each place the needle should be passed twice through the broad ligament (p. 283) to prevent slipping. Then the ovary and tube are cut off. If exceptionally there is any bleeding, the point is secured with a special ligature.

Another good way is to place a clamp inside and outside of the appendages. The tube and ovary are cut off, the arteries are tied separately, and finally the whole cut edge of the broad ligament is closed with a running looped catgut suture.

In passing the ligature around the ovarian vessels, care should be taken not to include the ureter, which crosses the pelvic brim just behind them.

If the tumor descends between the layers of the broad ligament, leaving the lower part of it free, this may be tied off in portions and gradually cut between two ligatures, so as to make the tumor more movable until a pedicle can be formed. If the tumor occupies the whole broad ligament, the peritoneum must be split over it and the tumor enucleated, leaving a cavity which must be treated as described under myomas of the uterus (p. 277). In rare cases the enucleation meets with such difficulties that it must be given up.

If the other set of appendages is healthy or only moderately diseased, it should be spared. If both sets must be removed, it is often better to remove the uterus, too, which may be the source of infection or become the cause of hemorrhage and pain; but, on the other hand, this is sometimes followed by loosening of the kidneys and enteroptosis, so that the surgeon is placed in a dilemma, from which he must try to free himself by taking all features of the special case into consideration.

Experience has shown that the enucleation of embedded appendages is much easier from below than from above. In order to obtain this advantage, *bisection of the uterus* may be chosen. It begins by separating the bladder and dividing the whole uterus in the median line, by which the vagina is opened in front and behind. Next, one half of the cervix is seized and pulled up until a strong resistance is opposed by the corresponding half of the vagina. This is cut close to the cervix, and one half of the uterus removed together with its appendages. The uterine artery is caught with a clamp before or after cutting it, and tied, the artery of the round ligament and the ovarian vessels are also tied and severed. The same is done on the other side. If there are intestinal adhesions, they are separated last. The vagina may be closed or left open for drainage. In order to prevent infection from the interior of the uterus, this may be seared with Paquelin's cautery.

Immediate and Remote Results of Oöphorectomy.—As a rule, there is a discharge of blood from the uterus for several days after the operation, which may be ascribed to the irritation caused by nerves being compressed in the pedicle. The same may explain the pain generally complained of during the first week. After that generally the sufferings for which the operation was undertaken cease. Menstruation

stops at once or soon in 86 per cent. of patients. Its continuance in 14 per cent. is ascribed to incomplete removal of the ovary, to the presence of a supernumerary ovary, to irritation of the stumps, or to disease of the uterus. Unfortunately, some patients do not feel any better than before and others even worse. Chronic peritonitis in the pelvis remains after the removal of the appendages. The operation itself may give rise to the formation of adhesions, which may necessitate a secondary operation.¹ Sometimes the uterus is congested or

FIG. 280.

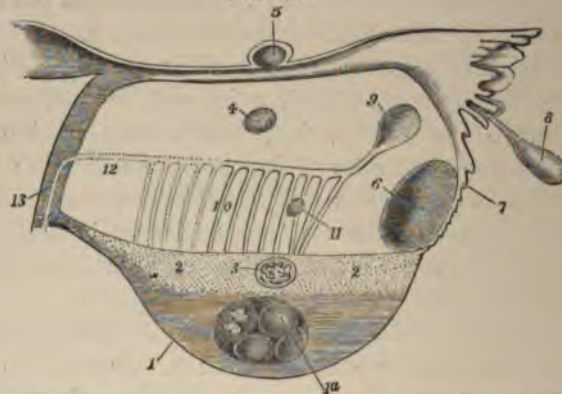


Diagram of origin of cysts in the ovary, tube, and broad ligaments (Doran.) 1, follicular zone, the seat of simple follicular or glandular proliferating cysts (1 a); 2, the medullary zone, with a papillomatous cyst (3); 4, cyst of broad ligament independent of parovarium or oviduct; 5, similar cyst, above the tube, but not connected with it; 6, similar cyst developed close to the fimbria ovarica (7); 8, hydatid of Morgagni; 9, cyst developing from horizontal tube of the parovarium; (cysts 4, 5, 6, 8, and 9, always have simple endothelial lining); 10, parovarium (the dotted lines represent the inner portion, always more or less obsolete in the adult); 11, small cyst developing from a vertical tube (cysts that have this origin or that spring from the obsolete portion have a lining of cubical or ciliated columnar epithelium, and tend to develop papillomatous growths, as do cysts in the vascular zone near the hilum) (2); 12, Gartner's duct, often persistent in the adult as a fibrous cord; 13, track of that duct in the wall of the uterus (unobliterated portions may become the origin of cysts in the uterus or vagina).

inflamed, which produces leucorrhœa and hemorrhage, and may call for its subsequent removal.

Experiments on animals have proved that the extirpation of the ovaries has a deep effect on metabolism: the phosphates in the urine and the carbonic acid in the expired air diminish, while the weight of the body increases. Many spayed women grow fat and dyspeptic. The sexual appetite may diminish, disappear, increase, or remain unchanged. Congestion to the head and thorax and perspiration appear

¹ Garrigues, "Secondary Operations." *Annals of Gynecology and Pediatrics*, June, 1897.

soon after the operation and may continue for years. In a large percentage melancholia has developed. Other disturbances that have been noticed are loss of memory, irritability of temper, impairment of vision, night-mare, insomnia, a more masculine voice, and skin affec-

FIG. 281.



Bilateral oligocystic ovarian tumors. (Hooper.)

tions. If all these untoward symptoms teach one not to be precipitate in taking the responsibility of depriving a woman of her ovaries, the fact remains that a large number of women have been freed by the operation from excruciating sufferings and become useful members of the community. But every effort should be made to save at least one

FIG. 282.



Ovary with many dropsical follicles. (Leopold.)

ovary or part of one. It must also be remembered that the law requires the operator to obtain the patient's consent to remove her ovaries. Otherwise he is guilty of mayhem and liable to a suit for damages.

The sufferings after oophorectomy may be combated with bro-

mides, shower baths, superficial cauterization of the nape of the neck, venesection, leeches, scarification of the vaginal portion, fly-blisters, galvanism, or high-tension current. Good effect may be seen also from the internal administration of 2 grains daily of dried ovarian tissue of sheep.

Perhaps even a radical cure and pregnancy may be obtained by *implantation* of a piece of ovarian tissue into the fundus uteri or the oviduct. The graft may be taken from the patient herself or another individual.

(b) *Vaginal Salpingo-oöphorectomy*.—The appendages may be

FIG. 283.



Ovaries with pedunculated cysts. (Winkel.) *a*, anterior wall of uterus cut open, showing a primary sarcoma of the body; *b c*, ovaries with multiple pedunculated cysts; *d e*, tubes; *f*, posterior wall of bladder.

reached by *posterior colpotomy* (p. 253),¹ and additional space may be gained by adding to the transverse incision a longitudinal, extending to the bottom of Douglas's pouch. But most operators prefer *anterior colpotomy* (p. 252), which leads more directly to the appendages and allows one to draw the body of the uterus into the vagina.

If both sets of appendages must be removed, much space is gained by beginning with vaginal hysterectomy; but this procedure has the great drawback that the appendages are torn out in the dark, while we have seen the advantage of leaving at least one ovary, or part of one.

¹ Garrigues, "Vaginal Hysterectomy and Oöphorectomy after Symphyseotomy," Med. Record, Feb. 23, 1895.

Comparison between Vaginal and Abdominal Salpingo-oöphorectomy.

—The vaginal section causes less shock; there is less risk of hernia; and no visible cicatrix is left. On the other hand, the abdominal section offers the immense advantage that the whole pelvic cavity can be inspected and treated; conservative operations on the appendages are performed better; the appendix vermiformis may, if necessary, be removed, and intestinal adhesions loosened much more thoroughly.

§ 6. **Neoplasms.**—The ovaries are frequently the seat of neoplasms, either *cystic* or *solid*.

A. **CYSTS.**—*Pathological Anatomy.*¹—The ovaries, the tubes, and the broad ligaments often contain cysts, as diagrammatically demonstrated in Fig. 280. Four varieties of ovarian cysts are distinguished: dropsy of the Graafian follicle (*hydrops folliculi*), proliferating cysts, dermoid cysts, and tubo-ovarian cysts.

I. Dropsy of the Graafian Follicle.

—A cyst is proved to be follicular if the ovum is found in it; and by extension we conclude that other cysts, even if no ovum is found, are of follicular origin when the wall and the fluid are like those of the indubitable follicular cysts. A single follicle may develop and cause the atrophy of the whole ovary, constituting a *monocystic tumor*, which may become as large as the uterus at term. There are no traces of partitions. The wall consists of two dense layers separated by loose connective tissue and corresponding to the tunica propria of the follicle and the combined tunica fibrosa and albuginea. The outside is covered with short columnar epithelium, the inside with a somewhat longer one. The fluid is serous, alkaline, and almost colorless. It does not coagulate spontaneously, as does that of some fibrocysts,

FIG. 284.



Rokitanski's tumor.

¹Garrigues, "The Diagnosis of Ovarian Cysts by Means of their Contents," New York, 1882. Wood. Also, Amer. Jour. Obst., January, April, July, 1882.

nor by boiling, as does that of other cysts. It contains paralbumin, which is precipitated by the addition of a small amount of acetic acid, and redissolved by a larger amount of the same. Under the microscope it shows only a few granules, no cells.

Sometimes a small number of follicles increase in size, forming an *oligocystic tumor* (Fig. 281). The single cysts are separated by partitions, which rarely become absorbed. In other cases many follicles become dropsical (Fig. 282). These follicles may protrude on the surface and become pedunculated (Fig. 283). Such an ovary may form a large tumor, like a bunch of grapes and composed of innumerable cysts, varying in size from a pin-head to an orange (*Rokitanski's tumor*) (Fig. 284).

FIG. 285.

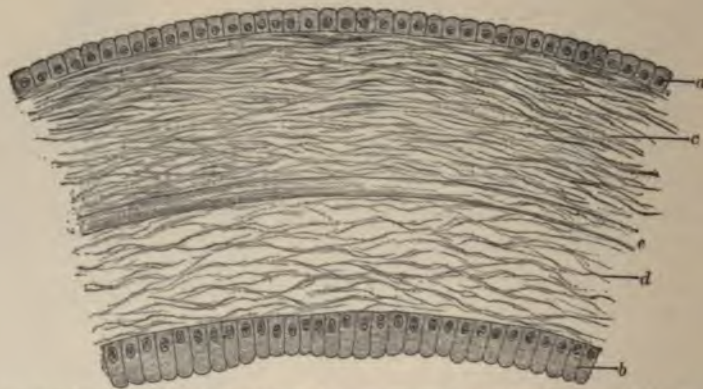
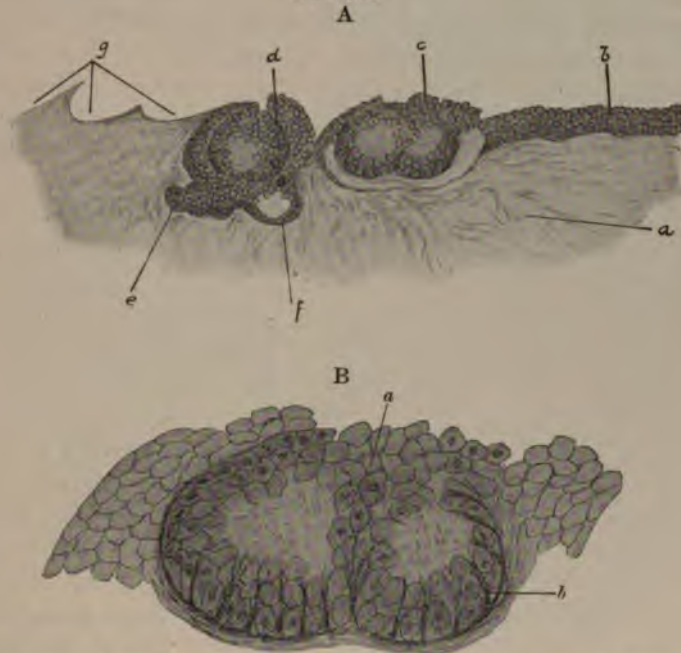


Diagram of wall of glandular ovarian cyst. a, external epithelium; b, internal epithelium; c, outer layer; d, inner layer; e, loose connective tissue.

II. *Proliferating, or Myxoid, Cysts.*—While the cysts so far contemplated—the hydropic follicles—are rare, the proliferating cysts are much more common. They are called *proliferating* because they produce new cysts, or papillary growths, from their inner surface, which dropsical follicles never do. And they are termed *myxoid* because their inner surface is like a mucous membrane, in contradistinction to dermoid cysts, whose wall resembles skin.

(a) *Glandular ovarian cysts* are the most common and attain the largest size. Their wall (Fig. 285) is composed of two layers, like those of dropsical follicles. The outer epithelium is also similar; while the inner undergoes the remarkable development which characterizes this kind of tumor. It is polymorphous,—columnar, goblet-shaped,

FIG. 286.



A. inner surface of glandular ovarian cystoma, enlargement 120. *a*, connective tissue; *b*, epithelium; *c*, bowl-shaped depression, with small opening; *d*, a similar one, closing up; *e, f*, buds of epithelial cells, growing from the bottom of the bowl; *e, f*, buds from which the epithelium has been removed.

B, same as *c* in Fig. A, enlarged 360 times. It is composed of two pouches, uniting at the top (*a*). The centre of each is undergoing liquefaction. A kind of thready material (*b*) is seen extending from the periphery into the interior of the pouch between the epithelial cells (cement substance).

FIG. 287.



Melting of epithelial cells in secondary ovarian cyst, setting the nuclei free.

and flat epithelial cells being mixed,—but the long columnar predominates. It is stratified and forms pouches, which at first are sit-

uated regularly side by side and have about the same size (Fig. 286), but on account of the constant proliferation of epithelial cells, some of these become closed, thus forming *secondary cysts* in the wall of the primary cyst. The connective tissue of the wall closes over the epi-

FIG. 288.



Small glandular ovarian cyst with beginning absorption of partition. (Doran.) Slightly reduced.

thelial pouch. In the beginning this is a nearly solid mass of cells, but soon these become liquefied, setting the nucleus free (Fig. 287).

Simultaneously with this production of new cysts, a diminution in their number takes place by the absorption of the partition between two contiguous cysts. At first there is only a small opening (Fig. 288); but gradually this increases, until finally the whole partition disappears, leaving only a ridge (Fig. 289). The normal ovarian tissue disappears when the ovary reaches a few inches in

size. By the repeated process of formation of secondary cysts and absorption of partitions, enormous tumors may be produced, which always are *multilocular*, even if one predominates. They may reach from the breasts to the knees and become so heavy that they weigh more than the balance of the body (Fig. 290).

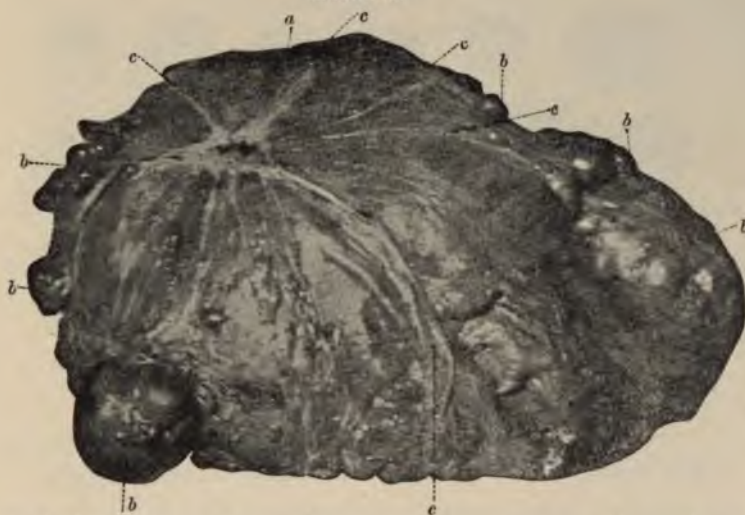
The outer layer of the wall is dense, white, or pearl-gray, and does not take part in the glandular proliferation. The inner is smooth, soft, velvety, and reddish, with yellow or brown patches or calcareous incrustation. It furnishes the connective tissue that enters into the composition of the secondary cysts.

The glandular cystoma has, as a rule, a pedicle. Being characterized by cell-proliferation and the formation of connective-tissue walls, it comes near to carcinoma in structure; but the lymphatics are not implicated, and there is an accumulation of fluid in the interior. An ovarian cyst may, however, become carcinomatous.

Contents of Glandular Cysts.—There is a kind of ovarian cystoma, called *parvilocular*, which is nearly solid. The cut surface looks like

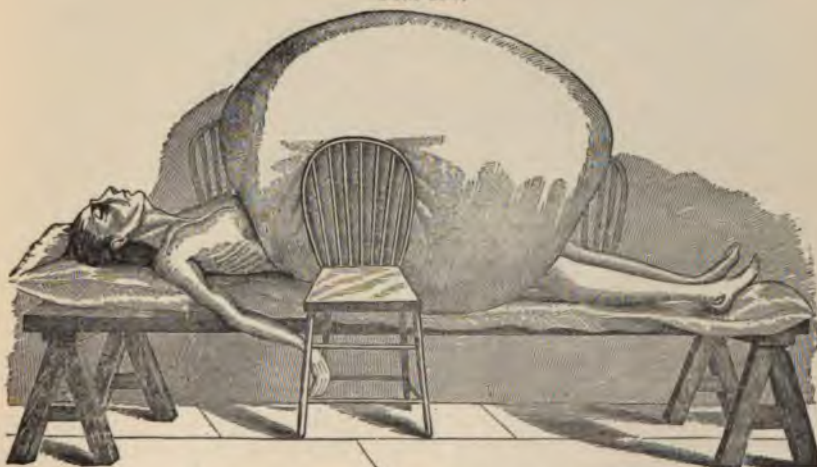
a honey-comb, and the small compartments are filled with a thick, gelatinous, structureless substance.

FIG. 289.



Large glandular ovarian cyst removed by the author. *a*, primary cyst; *bb* secondary cysts; *cc*, ridges, remnants of absorbed partitions. The specimen is turned inside out and stuffed with cotton.

FIG. 290.



Enormous glandular ovarian cystoma. (L. Rodenstein.)

Common glandular ovarian cysts contain a viscid, rather thick, grayish or brownish fluid that coagulates on boiling. It is full of form-

elements, the most important of which are columnar epithelial cells, Nunn's gorged corpuscles, or Bennett's large corpuscles (Fig. 291),

FIG. 291.



Nunn's gorged corpuscles, Bennett's large corpuscles, epithelial cells in fatty degeneration.

which are epithelial cells in fatty degeneration, and Drysdale's corpuscles, or Bennett's small corpuscles, which I take to be nuclei in fatty degeneration (Fig. 292).

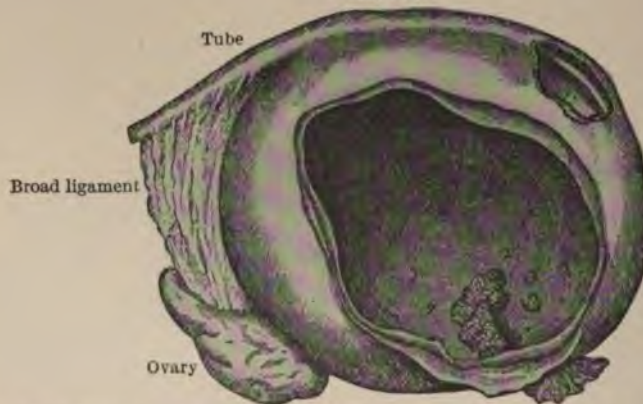
FIG. 292.



Drysdale's corpuscles, Bennett's small corpuscles, nuclei in fatty degeneration.

(b) *Papillary ovarian cysts* are much less common than the glandular variety. They grow much more slowly and do not become so

FIG. 293.



Papillary ovarian cyst springing from the hilum of the ovary, the greater part of which is not involved in the morbid growth. The cyst has forced its way between the layers of the broad ligament as far as the Fallopian tube. (Doran.)

large. They are often bilateral, and frequently intraligamentous (Fig. 293). From their inner or outer surface spring dendritic or cauli-

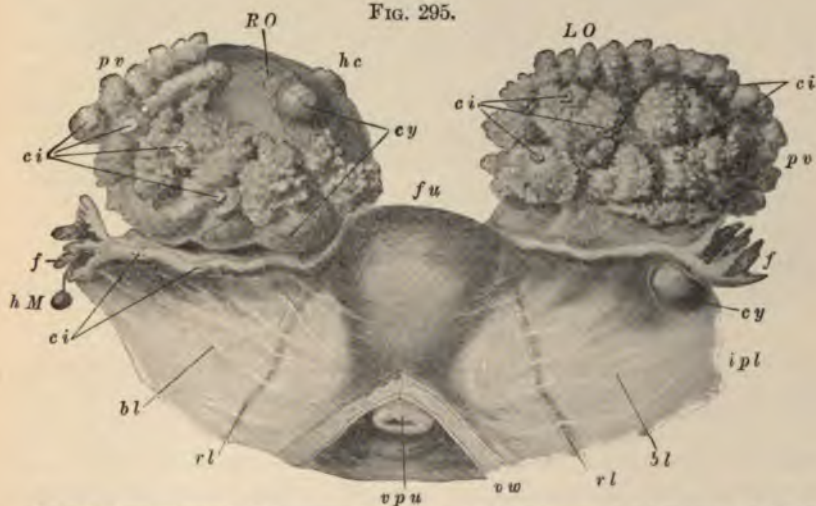
flower-shaped excrescences (Fig. 294), which may penetrate into neighboring organs. The inner surface is usually covered with cili-

FIG. 294.



Papillomatous ovarian cyst. (Museum of the College of Physicians and Surgeons.)

FIG. 295.



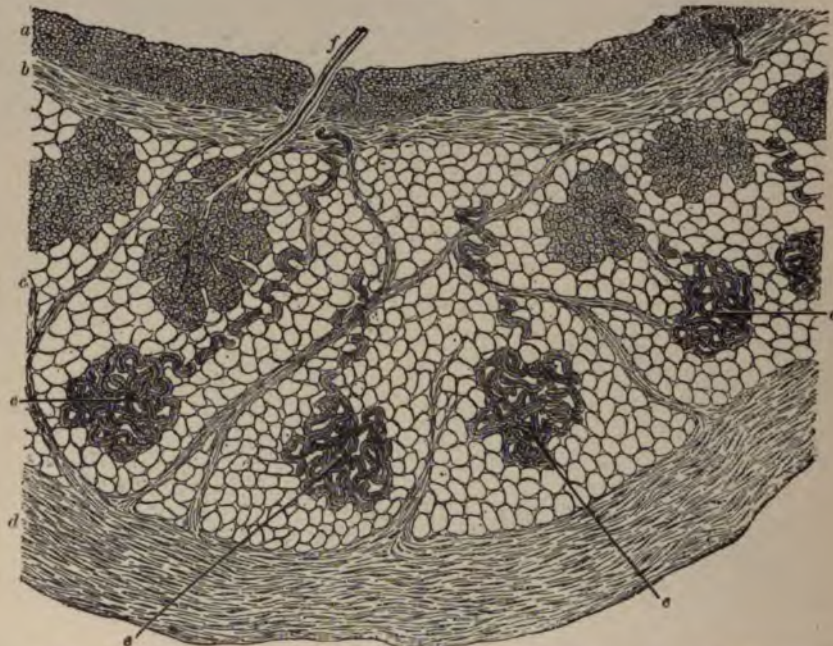
Superficial papillomas on both ovaries. (Coblentz.) *RO*, right ovary; *LO*, left ovary; *fu*, fundus uteri; *vp u*, vaginal portion of uterus; *vw*, vaginal wall, cut open; *rl*, round ligament; *bl*, broad ligament; *ipl*, infundibulopelvic ligament; *cy*, cysts; *ci*, calcareous incrustations; *pv*, papillary vegetations; *ff*, fimbriae; *hc*, hyaline cyst; *hM*, hydatid of Morgagni.

ated epithelium, and the fluid is not viscid or colloid, but watery. Similar papillomas may develop from the outer surface of the ovary

(Fig. 295). In the same cystoma some cysts may be glandular and others papillomatous.

III. *Dermoid Ovarian Cysts*.—These differ from other ovarian cysts, while they are identical with dermoid cysts in other organs. Their wall consists of an outer layer of dense connective tissue like that of other ovarian cysts, a layer of loose adipose tissue, and an inner layer which is like skin covered with epidermis (Fig. 296) and pierced by hairs and the ducts of sweat-glands, which are situated,

FIG. 296.



Section through the wall of a dermoid cyst. (Wyder.) *a*, epidermis; *b*, deep layer of connective tissue, like derma; *c*, loose adipose tissue; *d*, superficial dense connective-tissue layer; *e*, sweat-glands; *f*, hair-follicle and sebaceous gland.

as well as sebaceous glands, in the adipose tissue. The hairs sometimes form a switch several feet long. In other places may be found teeth (Fig. 297).

Dermoid cysts are much rarer than other ovarian cysts and are small or of medium size. In the same cystoma some compartments may have the dermoid and others the myxoid type. Commonly only one ovary is affected. Adhesion and rupture into the bladder may allow hairs to escape with the urine (*pilimiction*).

The fluid is full of fat and cholesterin.

This variety predominates in childhood. Similar tumors are found in other organs, but they are more frequent in the ovaries.

IV. *Tubo-ovarian Cysts*.—This is a combination of cystic salpingitis and any kind of ovarian cyst. An adhesion between the two takes place and an opening is formed in the partition. The fimbriæ are found outside or inside of the cyst. This tumor has the shape of a retort (Fig. 298).

FIG. 297.



Portions of the wall of a dermoid cyst. (Ziegler.) *a*, wall; *b*, elevation composed of fatty and cutaneous tissues; *c*, hair; *d d*, teeth.

Pedicle.—Most ovarian cysts are pedunculated; but some, especially the papillary variety, develop between the layers of the broad ligament and have no pedicle. If there is one, it contains always the ovarian ligament and part of the broad ligament and generally the tube. It embodies also arteries, which may become as large as the radial; veins, that may be as thick as a finger; lymphatics; and nerves; all bound together with connective tissue and unstripped muscle-fibres, and covered with a sheath of peritoneum.

Torsion of the Pedicle.—The pedicle, especially that of dermoid cysts, may become twisted, either suddenly or by a gradual process. Sudden twisting leads to gangrene and fatal peritonitis. Gradual torsion causes

purulent, or ichorous fluid and that contained in dermoid cysts cause peritonitis and death.

Degeneration.—Ovarian cysts, especially the papillary variety, have great tendency to become carcinomatous or sarcomatous.

Pseudomyxoma of the Peritoneum.—When colloid contents of ovarian cysts enter the abdominal cavity they may produce similar tumors growing from the peritoneum, a condition which is called *pseudomyxoma of the peritoneum*, or *gelatinous disease of the peritoneum*.

The Origin of Ovarian Cysts.—Follicular dropsy, as its name indicates, is always produced in a Graafian follicle. Glandular cysts have probably the same origin. The papillary variety can also arise in this way; but is, perhaps, sometimes developed from remnants of the Wolffian body in the hilum of the ovary. Dermoid cysts are formed by *invagination*; in the axis cord it is impossible to distinguish the individual blastodermic layers—the epiblast, the mesoblast, and the hypoblast. We can, therefore, easily imagine that in the cell-heap destined to form the ovary, which is a portion of the mesoblast, may be included cells that belong to the epiblast or the hypoblast or other portions of the mesoblast, and that in this way the foundation is laid for the production of skin, hairs, teeth, etc. When whole organs, such as a breast, an eye, etc., are found in dermoid cysts, it is, however, a question if it is not rather to be looked upon as a case of *fœtus in fœtu*,—that is, a combination of two fœtuses, one of which is hardly developed and is enclosed in the other.

Etiology.—Little is known about the conditions that lead to the formation of ovarian cysts. They may be congenital. They are much more frequent in the child-bearing age than before puberty or after the climacteric, and appear much oftener in nulliparæ than in women who have borne children, which goes far to show that the physiological rest during pregnancy and lactation serves as a preventive. Since we have seen that chronic oophoritis is often accompanied by the formation of numerous small cysts, it is not unlikely that the same disease may result in the development of large cysts.

Symptoms.—Commonly the patient complains of pain in one or both iliac fossæ or the sacral region. In the beginning menstruation is normal; later it becomes profuse; and, finally, when the ovarian tissue is destroyed, it may cease altogether. It is often painful. Uterine hemorrhage may arise after the menopause. The patients are often sterile; and if they conceive, pregnancy frequently results in

abortion. The abdomen increases in size, and the patient can often tell from which side of her pelvis the swelling started. Pressure symptoms, such as we have described in connection with uterine myomas (p. 272) play a prominent part in the development, and, on account of the usually greater size of the tumors, they may even be much more pronounced. If the tumor is enclosed in the pelvic cavity,

FIG. 299.



Facies ovariana. (Spencer Wells.)

the uterus is crowded to the opposite side. It lies in the beginning in front of the ovarian cyst, later often behind it, and may be caused to prolapse. The veins of the abdominal wall become much enlarged in consequence of the impeded circulation in the inner veins. The tension of the skin over the abdomen may give rise to intolerable itching or a burning sensation.

The heavier the tumor becomes, the more the patient leans backward in order to keep her equilibrium, and her gait resembles that of a pregnant woman. When the growth continues, she cannot walk at all, and cannot

even lie on her back, but must seek support for her abdomen in the lateral position.

In the beginning her general health is good, but soon she loses flesh and strength. Digestion, respiration, circulation, innervation all suffer. Often sleep is disturbed. Pain, anxiety, sleeplessness, and emaciation in advanced cases cause pinched features and deep furrows in the face, constituting an *ensemble* known as *facies ovariana*, and well reproduced in Fig. 299. In rare cases the breasts undergo changes similar to those of pregnancy.

By physical examination a tumor is felt. As long as it is in the pelvic cavity it is too tense to give fluctuation. The uterus is crowded to the opposite side and forward. When the cyst rises into the abdomen it distends the abdominal wall and becomes fluctuant, and percussion furnishes a dull sound in the middle, surrounded by tympanic intestinal sound. The abdominal wall can be folded over the

tumor, and this can be moved if it is not adherent. The uterus may be felt independent of the tumor by bimanual examination or by introducing a sound into its cavity. Part of the tumor may often be palpated through the rectum. Auscultation reveals sometimes a blowing sound in enlarged and compressed blood-vessels, and palpation may give a sensation of crepitation, due to fresh adhesions. Certain measurements should be taken, by which one can judge more accurately of the size of the tumor and often of its position,—viz., the circumference at the level of the umbilicus and at the most prominent point of the abdomen, the distance from the umbilicus to the symphysis pubis, the ensiform process, and the anterior superior spines of the ilium. In tumors of moderate size the distance between the symphysis and the umbilicus is greater than from this to the ensiform process; and the distance from the umbilicus to the anterior superior spine is greater on the side from which the cyst springs. Later these differences are effaced. Even the pedicle may be felt. For this purpose the patient is anæsthetized, one assistant draws the uterus down with a traction-forceps inserted in the vaginal portion, another lifts the tumor up, while the surgeon makes a bimanual examination.

The accidents we have mentioned above develop symptoms which should be noticed, since they contain indications of the greatest importance for treatment. *Hæmorrhage* into the cyst causes a sudden increase in its volume and gives rise to the common symptoms of internal hæmorrhage—weak, rapid pulse; dyspnœa; pale, cold, clammy skin; and faintness. This condition calls for immediate ovariectomy. *Inflammation* produces fever, pain, and sensitiveness. *Suppuration* is marked by high temperature, repeated chills, and profuse perspiration. Inflammation may be combated with an ice-bag, but suppuration demands immediate removal of the cyst. *Torsion of the pedicle*, if slow, may take place without symptoms, except a gradual diminution of the tumor; but, if it occurs suddenly, it is accompanied by pain, enlargement and sensitiveness of the tumor, incessant vomiting, the vomit soon becoming green, and an accelerated pulse. It may in a short time lead to ascites, internal hæmorrhage, rupture, suppuration, or gangrene of the cyst, peritonitis, and death. Its course may also be less rapid and end the patient's life by slow infection and marasmus. By the just described manipulation the torsion may, perhaps, be directly felt. As soon as the diagnosis is made, ovariectomy should follow. *Rupture of the cyst*, if its contents are bland, may have no

consequences, except diminution of the tumor, diuresis, and perspiration. Blood may produce a retro-uterine hæmatocele. Pus and other acrid fluid cause peritonitis. The rupture may be accompanied by pain, and the fluid may be felt moving freely in the abdomen. If serious symptoms appear, ovariectomy should be performed at once. If the cyst ruptures into the stomach, its contents are vomited. If it opens into the intestine, it is evacuated through the anus. If it communicates with the bladder, cyst-fluid, hairs, and teeth may be evacuated with the urine. If it ruptures into the vagina, a similar evacuation takes place through the vulva. As the rupture into a hollow organ may result in a cure, it is best to await developments before operating. *Ascitic fluid* may accumulate outside of the tumor and be beneficial by preventing adhesion, but a large amount increases all the pressure symptoms. *Peritonitis*, characterized by the usual symptoms—pain, fever, vomiting, and meteorismus—joins often an ovarian cyst, and is generally an indication for ovariectomy. *Intestinal obstruction* is marked by constipation, vomiting, distention of the abdomen, and pain, and calls for immediate ovariectomy.

Explorative puncture through the abdominal wall is obsolete. That through the vagina is frequently used in different conditions, and familiarity with ovarian fluid is, therefore, of practical value. There is no chemical substance or form-element pathognomonic for ovarian cysts, but if an abdominal cyst contains a large number of the small corpuscles described above, there is strong presumption of its being ovarian.

Explorative Incision.—If the diagnosis of an abdominal tumor cannot be made by the described symptoms and examinations, it is proper to make an incision in order to be able to palpate and even inspect the contents of the abdomen. In this way it may be ascertained whether a case is operable or not. In the first eventuality the incision becomes only the first step in the operation.

Differential Diagnosis.—Ovarian cysts may be and have been mistaken for so many other conditions¹ that we cannot enter on details in this place, and must confine ourselves to mentioning a few.

A pelvic ovarian cyst is usually unilateral, globular, or oval, while *hydro-* and *pyosalpinx* are generally bilateral, and form elongated, sausage-shaped tumors.

If the tumor has risen into the abdominal cavity, the question of *pregnancy*—normal or ectopic—presents itself. The gravid uterus con-

¹ Garrigues, "Text-book of Diseases of Women," third edition, pp. 630–636.

stitutes one mass with the cervix. It develops in a regular way, its size corresponding to the last monthly period. After the middle of pregnancy, fetal heart-sounds may be heard. Fetal movements may be heard and felt. Portions of the fetal body can be palpated. The cervix and lower uterine segment are softened. The vagina has a dark purple color. Ballotement is perceived.

In *hydramnion* the fetal heart-sounds may be inaudible and the fetal parts difficult to palpate, but the other signs of pregnancy are present; there is an unusual distention; and the cervical canal may be wide open, allowing the examiner to place his finger right on the ovum. If the child is dead, the fetal heart-sounds and movements are absent; but there are the history and other signs of pregnancy, and the fœtus can be felt.

Ectopic gestation rarely advances so far as to form a large abdominal tumor. We find the signs of pregnancy combined with those of ectopic gestation: the patient has attacks of violent pain, shreds of decidua may be expelled from the uterus, and, if the fetus is in the abdominal cavity, it is felt with uncommon distinctness right under the abdominal wall.

An *hydatid mole* is characterized by vesicles being expelled from the uterus.

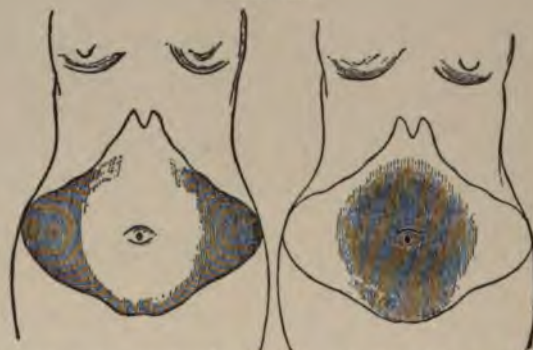
Fibrocystic tumors of the uterus may be exceedingly difficult to differentiate from ovarian cysts. The chief points of difference are that fibrocysts are much rarer, and usually appear after the thirtieth year of the patient. It develops slowly. The constitution suffers less. The uterine cavity is much enlarged. The tumor forms one mass with the uterus. Hard portions are often felt at the top, while in ovarian cysts they are situated at the base.

In *ascites* the abdomen is flat, fluctuation is very distinct, percussion-tone is tympanitic above and dull below, in whatever position one places the patient, while in ovarian tumor the abdomen is pointed, the percussion-tone is dull over the tumor and tympanitic all around (Fig. 300). The uterus is freely movable in ascites, whereas with very large ovarian cysts it becomes immobile. *Encysted peritonitic exudation* gives a history of acute inflammation. *Retro-uterine hæmatocele* begins suddenly with pain at the time of the monthly period or menorrhagia, and gives rise to fever. The tumor is at first soft and hardens later. In *tubercular peritonitis* the agglutinated intestine and omentum may form a tumor surrounded by ascitic fluid, but usually the disease is found in very young persons; generally the pleura or

the lungs are affected ; the abdomen is very sensitive ; sometimes the centre of the wall is pink and œdematous.

Cysts of the broad ligament are much rarer than ovarian cysts. They hardly acquire larger dimensions than the head of an adult, they develop slowly, are immovable, and are situated close to the uterus. *Hydronephrosis* is an acute disease, and the tumor lies behind the intestine. There is a history of urinary trouble. *Renal cysts* are rare, give a similar history, are covered by the intestine, and develop from above downward. *Splenic tumors* develop from the left hypochondrium downward. If solid, they retain the shape of the spleen, and inden-

FIG. 300.



Percussion-sound in ascites to the left and ovarian tumor to the right. The shaded portions dull.

tations may be felt along the anterior edge. All tumors coming from above leave for a time a resonant space above the symphysis pubis. Injection of water into the intestine and production of carbonic acid in the stomach (p. 38) drive a tumor in the direction from which it developed. A *phantom tumor* is a simulacrum of a tumor sometimes found in hysterical women. It is produced by adipose tissue and contraction of the abdominal muscles, and may even give dull percussion-tone. The patient often thinks she is pregnant, and there may be changes in the breasts ; but all sure signs of pregnancy are absent ; and when the patient is anæsthetized, the apparent tumor disappears, to be reformed when she comes out from the anæsthesia (Figs. 301, 302).

Complications.—Ovarian cysts may be combined with *cancer of the uterus*. This constitutes a contraindication for ovariectomy, unless the uterus can be extirpated at the same time. In advanced *tuberculosis* the radical operation is also contraindicated. An ovarian cyst, even

a bilateral one, may be combined with *pregnancy*. The diagnosis is made by the history of the case and an exact examination. When indubitable signs of pregnancy are found in connection with a double tumor, the physician must ascertain whether it is only a case of twins or a combination of a gravid uterus with an extra-uterine tumor; and, furthermore, he must decide whether this mass is due to an extra-uterine pregnancy or a tumor, and, in the latter case, whether it is ovarian or not.

The simultaneous growth of the gravid uterus and an ovarian tumor causes such tension and pressure that, as a rule, intervention becomes necessary. Ovariectomy may be performed, but is sometimes followed by abortion. The ovarian cyst may be tapped and the radical operation postponed till after the puerperium. Or, when the child is viable, premature labor may be induced.¹

Prognosis.—As a rule, a woman affected with an ovarian cyst lives only a few years.

Treatment.—Whenever it is possible, the tumor should be removed by *ovariectomy*. Another mode of treatment is by *tapping*, which is not without drawbacks and dangers, gives only temporary relief, and must be repeated with always shorter intervals. Nevertheless, there are circumstances under which it is perfectly legitimate:

1. If a woman refuses to have ovariectomy performed, tapping may relieve suffering and prolong life.
2. When the ovarian cyst is complicated with pregnancy, it is sometimes better to postpone the radical operation till after the puerperium and afford temporary relief by tapping.
3. The removal of a very large cyst has been followed by sudden

FIG. 301.



Patient with phantom tumor. (S. Wells.)

¹ Garrigues, "Obstetrics," 1902, p. 572.

death due to anæmia of the brain or the impaired condition of vital organs. It may then be better to evacuate the largest cyst slowly by aspiration and give the whole organism time to recuperate before proceeding to the extirpation.

4. Tapping may be useful in intercurrent acute diseases and in advanced chronic diseases, such as cancer, tuberculosis, or Bright's disease.

Tapping should be performed through the abdominal wall, where the largest compartments of the cyst are found. The skin must be disinfected. The compartment opened should be entirely emptied. It is best to use Potain's aspirator; but if the fluid is too thick for the needle, a larger trocar must be used. If acrid fluid escapes into the

peritoneum and produces peritonitis, ovariectomy must be performed.

A parvilocular ovarian cyst with colloid contents cannot be diminished by tapping.

Ovariectomy.—Ovariectomy is the removal of an ovarian tumor, while the extirpation of a small ovary is called *oöphorectomy*.

Indications and Contra-indications.—As a general rule, ovarian tumors should be removed as soon as diagnosed, since thereby the formation of adhesions, the above-mentioned acci-

FIG. 302.



The same anesthetized.

dents, cancerous degeneration, and the drain on strength may be prevented. Special indications are, as stated above, considerable hemorrhage into the cyst, rupture of the cyst followed by alarming symptoms, suppuration of the cyst, torsion of the pedicle, peritonitis, or intestinal obstruction. The operation may be performed at any age.

Ovariectomy, on the other hand, is contra-indicated in advanced tuberculosis or chronic nephritis, or when it is complicated with cancer in another organ, unless this can be removed too. Cancer of

the ovary constitutes also a counter-indication, if it involves the surrounding tissue or has affected the constitution.

Ovariectomy may be performed through the abdominal wall or from the vagina.

Vaginal ovariectomy should be limited to cases in which the tumor is small and freely movable. The great frequency of adhesions militates against it when the tumor has risen into the abdominal cavity. Small cysts behind the broad ligaments may be reached by the much simpler posterior colpotomy, but intraligamentous cysts should be approached by anterior colpotomy.

Abdominal Ovariectomy.—Preparatory Treatment.—If the patient has been living under unfavorable circumstances, she should be strengthened by good food, fresh air, baths, and tonics. If her urine is scanty and loaded, she should be given diuretic mineral waters. As to the preparations for the operation, the reader is referred to what has been said in the GENERAL DIVISION (pp. 79–89).

The removal of an ovarian cyst without adhesions and with a good pedicle is an easy operation, for which few instruments are needed; but as numerous complications may be met with, the surgeon must be prepared to overcome them. At least one assistant beside the anæsthetist is needed, and most surgeons prefer to have a second to hand instruments. Behind and to the left of the operator is a table for instruments; behind and to the right one basin with corrosive sublimate solution and one with sterile water.

The chief steps in ovariectomy are, 1, the abdominal section; 2, the removal of the cyst; 3, the closure of the wound; and, 4, the dressing.

1. The *abdominal section, or laparotomy*, is like that for abdominal hysterectomy (p. 282), with this exception, that a simple cyst without adhesions may be taken out through an incision long enough to admit two fingers, similar to the one which we have described for certain cases of oöphorectomy (p. 323). Then it is not even necessary to raise the patient's pelvis.

2. *Removal of the Cyst.*—When the abdominal cavity is opened the cyst, if it is of sufficient size, appears in the wound as a pearl-gray, glistening body. In order to diminish it, a curved trocar (Fig. 303) is thrust into it and the fluid received into a basin, which may be emptied into a pail.

As soon as the cyst collapses somewhat, it is seized with a cyst-forceps (Fig. 304).

After a while there will be room for a second such cyst-forceps. If there are several compartments, one is opened from the other with trocar, scissors, or the finger, until the whole cyst can be pulled out of the abdomen. Next, the pedicle is tied, cut, and treated as in oophorectomy (p. 324). It is then dropped, the intestine held back, and the omentum drawn down over it. The distal end of the stump does not slough, because new capillaries are soon formed and nourish it.

For smaller cysts that are still in the pelvic cavity or for the work on the pedicle the elevated-pelvis position is very useful; but it should

FIG. 303.



Emmet's ovariectomy trocar.

never be used longer than absolutely necessary, as it is not free from danger. During the incision of the abdominal wall and its closure the patient should lie horizontally.

After having removed the tumor, the *other ovary* is examined. In young women it should, as a rule, be left. After the climacteric it should be removed, and likewise if the uterus contains a fibroid, or if for any other reason it is desirable to produce a premature menopause.

If no blood or cyst-fluid has found its way into the peritoneal cavity, this is closed; but before doing so, the pads and artery-forceps used during the operation should be counted, as it often has happened that such objects have been left in the abdomen.

The closure of the abdominal incision, the dressing, and the after-treatment are as taught under ABDOMINAL HYSTERECTOMY (p. 284.)

According to this description ovariectomy would seem an easy operation, and so it is, if there are no adhesions and a good pedicle; but numerous and serious difficulties may be encountered, particularly from *adhesions* or *intraligamentous development* of the tumor. The latter is commonly observed with papillary cysts, which are more malignant and are liable to infect the peritoneum. In their further growth the extraperitoneal tumors may extend on the abdominal wall so as to be met before the peritoneum is reached; or into the mesentery, where

they lie behind the large and small intestine. If the lower and outer portion of the broad ligament is preserved, it may be tied off and cut between two rows of sutures, beginning at the infundibulopelvic ligament and cutting the tissue between the sutures as one proceeds, whereby the tumor is made more movable and space is gained. To prevent hemorrhage, each suture must embrace a part of the tissue comprised in the preceding one. Finally, the remainder of the broad ligament and the tube form a pedicle that is secured in the usual way.

If the tumor occupies the whole ligament, it must be *enucleated*. For this purpose an incision is made in the peritoneal covering and this stripped back. If the cyst lies in the abdominal wall, it can sometimes be removed without opening the peritoneal cavity at all. From the mesentery it must be enucleated. After the enucleation a cavity is left which must be treated as explained in speaking of intraligamentous myomas (p. 277.)

Incomplete Operations.—If it is evident on opening the abdomen that the operation cannot be finished, it is better not to begin at all; but if the surgeon has already advanced somewhat and finds it impossible to finish the operation on account of adhesions, subserous development, or cancer that has involved other organs, he may have recourse to one of three methods. He may fasten the edges of the cyst to those of the abdomen (*marsupialization*), or leave what he cannot remove, and close the abdomen, or puncture and drain through the vagina.

If the pedicle is very thick, it must be tied in more than two portions, which may be done by the *chain-ligature* (p. 98) or the *cobbler's stitch* (p. 99).

Toilet of the Peritoneum.—If blood, pus, or cyst-fluid has found its way into the peritoneal cavity, it should be removed before closing the abdomen. A little blood can be soaked up with small pads held in a sponge-holder, which is introduced to the bottom of Douglas's pouch. A small quantity of pus may likewise be wiped off, but then an iodoform-gauze drain must be left at the lower angle of the wound.

FIG. 304.



Nclaton's cyst-forceps. A, circular jaws with holes and pegs; B, catch.

If there is much blood, or much pus or cyst fluid has escaped, the abdominal cavity should be flushed with hot normal salt solution. This should be done through a tube as thick as a finger and introduced into the deepest recesses of the cavity. If there is still some oozing, a Mikulicz tampon may be used. But if there is a decided hemorrhage, its source must be searched for and the bleeding vessel tied.

Drainage is rarely needed and, if used at all, should preferably be instituted through the vagina.

Septic Peritonitis.—After ovariectomy, as well as after other laparotomies, may follow peritonitis, usually within four days. The symptoms are a small, rapid pulse, green vomit, pain, tympanites, and tenderness of the abdomen. There need not be any rise in temperature, or it may even be subnormal. It is due to infection. The bowels should be moved at once with a saline aperient or calomel; an ice-bag or ice-water coil should be placed on the abdomen; sulphate of quinine or salophen (gr. v—30 centigrammes) should be given every four hours; and whiskey or brandy should be administered freely (one or two pints in twenty-four hours). Normal salt solution, one or two pints, may be injected hypodermically or in a vein and repeated according to circumstances once or twice a day. To this may be added formalin in the proportion of 1 to 5000. Collargolum (3v—20 grammes—of a $\frac{1}{2}$ of 1 per cent. solution) may be injected into the vein, or, in the form of unguentum Credé (from gr. xxx to xlv—from 2 to 3 grammes) rubbed into the skin once daily. The normal salt solution may also be injected into the rectum with a rubber tube and funnel. First the intestine is evacuated by the injection, but besides that an absorption takes place which causes profuse perspiration and diuresis with reduction of high temperature. This must be kept up for an hour or more and repeated when the temperature rises. Of nuclein solution $\mathfrak{m}\times$ (60 centigrammes) may be injected hypodermically twice a day, or from \mathfrak{zss} to \mathfrak{zj} (from 2 to 4 grammes) given as often through the mouth; or $\mathfrak{m}\times$ (60 centigrammes) every 2 hours.¹ The wound may be reopened and the peritoneal cavity washed out with normal salt solution and peroxide of hydrogen; or sometimes the mere letting out of the gas by opening a couple of sutures suffices to bring on a cure.

If peritonitis supervenes as late as ten to fifteen days after the operation, it is probably due to mortification of the pedicle or other large masses, and then there is little hope of recovery.

¹ The doses are calculated for Parke, Davis & Co.'s preparation.

What is said here about septic peritonitis applies also to other forms of *septicæmia*.

Prognosis.—In uncomplicated cases the mortality is almost nil, but quite frequently there are complications, and the average mortality in the hands of skilful operators is still a little over seven per cent. In childhood and old age and in repeated ovariectomy it is even greater. Death is generally due to shock, hemorrhage, peritonitis, or *septicæmia*.

B. SOLID OVARIAN TUMORS.—Solid ovarian tumors are much rarer than cystic tumors of the ovary or solid tumors of the uterus. They may be *fibromas*, *papillomas*, *sarcomas*, *endotheliomas*, or *carcinomas*, for which the only cure consists in early ovariectomy. Or the neoplasm may be *tuberculous*.

Tuberculosis.—Next to the Fallopian tubes, the ovary is most frequently affected by genital tuberculosis. The infection may be carried from the external genitals, the uterus, and tubes, or be brought from other tuberculous organs by the blood current.

Pathological Anatomy.—Miliary tubercles are rare. The affection may be limited to the surface or implicate the whole ovary. This is enlarged and softened and contains cheesy deposit varying in size from a millet-seed to a marble. These nodules may break down and empty their contents into the abdominal cavity, producing peritonitis. The ovary is generally covered by inflammatory exudation and adhesions.

Symptoms.—The symptoms are the same as in chronic oophoritis.

Diagnosis.—The diagnosis can be made only if the ovary is felt enlarged in a woman affected with pulmonary tuberculosis or with tuberculous ulcers in the vulva or vagina, or if cheesy masses and tubercle bacilli are expelled from the uterus.

Treatment.—If the disease is limited to the ovary, salpingo-oophorectomy should be performed. This should be done also if tuberculosis of the lungs has been checked. If the uterus is implicated, panhysterectomy with removal of the appendages is indicated. But if the disease is spreading in the lungs, no radical operation on the genitals should be attempted; and the treatment should then be only medical and hygienic (pp. 138, 303).

§ 7. *Oophoralgia, or Neuralgia of the Ovary*.—The ovary may be the seat of neuralgia. Generally, this appears as part of hysteria, but may be also of malarial origin. The left ovary is much more frequently affected than the right, which probably is attributable to the presence of the rectum, with hard scybala, and the anatomical peculiarities of the ovarian vein on this side (p. 11). But the disease

may be also bilateral. The pain may begin spontaneously or be provoked by pressure on the ovary. It is extremely severe, and is felt in the hip, shooting up to the lumbar region or down the leg. Often it is combined with hemianæsthesia of the corresponding side and attacks of hystero-epilepsy.

Symptoms.—Pressure exercised on the ovary causes **cardialgia**, vomiting, palpitation, accelerated pulse, globus hystericus, pain in the corresponding temple, sometimes a hissing sound in the ears, darkening of the eyesight, loss of consciousness, and convulsions. On the other hand, the same pressure may check a spontaneous attack.

Diagnosis.—In *chronic oophoritis* the ovary is enlarged and often adherent.

Treatment.—The patient should be kept in bed and have anti-hysteric or antimalarial remedies. The pain should be controlled with anodynes, galvanism, or high-tension faradic current. Desiccated parotid-gland substance (gr. ii—12 centigrammes) in tablets, from three to six times a day, has proved very effective. Oophorectomy has sometimes excellent results, but is in other cases useless.

CHAPTER VII.

DISEASES OF THE PELVIS.

UNDER this heading are comprised the affections of the peritoneum, the connective tissue, and the blood- and lymph-vessels of the true pelvis, including the ligaments of the uterus.

§ 1. **Malformations.**—A *defective development of the tissues in front of the uterus* produces ante-position; a *similar anomaly of the tissue behind that organ* causes retro-position, and an *insufficient size of one of the broad ligaments* results in latero-position. Perhaps, *too short round ligaments* give rise to some cases of ante-flexion and ante-version.

The pouch of the peritoneum that follows the round ligament through the inguinal canal, the so-called *canal of Nuck*, which normally changes into a fibrous string, *may remain open*.

§ 2. **Diseases of the Broad Ligaments.**—A. VARICOCELE OF THE BROAD LIGAMENT, OR PAROVARIAN VARICOCELE.—This corresponds to the same disease in man, but is much rarer, which is accounted for by the horizontal course of the veins and their numerous anastomoses. It may reach the size of a hen's egg, and is composed of a conglomeration of veins with thickened walls. It is much more frequent on the left side, which is attributable to the absence of a valve and the unfavorable relation between the ovarian and the renal veins on this side.

Etiology.—The chief causes are subinvolution after childbirth; retro-displacements of the uterus, by which the broad ligaments are twisted and circulation impeded; and, on the left side, the pressure of scybala.

Symptoms.—The disease occasions a dull pain extending to the kidney. By bimanual examination, with one finger in the rectum, a globular, doughy tumor, or separate swollen veins, are felt in the broad ligament. The pain and swelling increase in the erect position.

Prognosis.—The pain may become so great that the patient is unfit for work and becomes a bedridden invalid. The dilated veins may rupture and form a hæmatocele or hæmatoma.

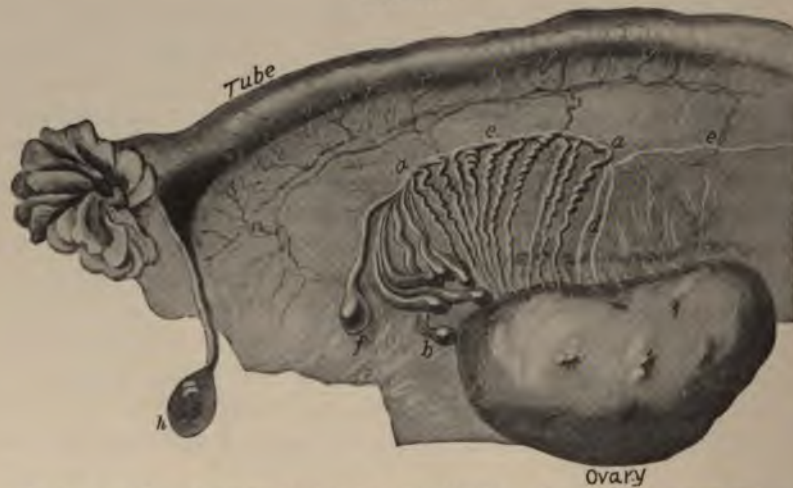
Diagnosis.—*Salpingitis* is sausage-shaped; *oophoritis* is more sensitive on pressure; in *peritonitis* and *cellulitis* the swelling is more dif-

fuse; none of them become smaller in the recumbent position. The *swollen ureter* is accompanied by symptoms of disturbance in the uropoietic organs.

Treatment.—In the beginning rest in the recumbent position, attention to the bowels, faradism, and massage may effect a cure. If a distinct tumor has developed, it should be extirpated by laparotomy.

B. CYSTS OF THE BROAD LIGAMENT.—A cyst of the broad ligament is one that develops in the broad ligament outside of the ovary. It is often called *parovarian* cyst, but this is correct only if it is developed in the parovarium (Fig. 305), while it may form also in any other part

FIG. 305.



Ovary, parovarium, and Fallopian tube of adult. (Kobelt.) Natural size. *aa*, parovarium, or epoöphoron (not to be confounded with the *paroöphoron*, which means that part of the ovary situated near the hilum, which does not contain ovisacs—the medullary zone); *b*, remains of the uppermost tubes of the Wolffian body; *c*, middle set of tubes, constituting the parovarium; *d*, lower atrophied tubes; *e*, atrophied remnants of Wolffian duct, or Gartner's canal; *f*, the terminal bulb or hydatid of the Wolffian duct; *h*, hydatid of Morgagni.

of the broad ligament (see Fig. 280, p. 328). These cysts are much rarer than ovarian cysts. As a rule, they are monocystic, and generally they attain only the size of a uterus at the end of six months' gestation. Commonly the wall is thin. It consists of the peritoneum with its endothelium, and a stratum of connective tissue and unstriated muscle-fibres, with few blood-vessels. The inner surface is smooth or wrinkled, but has never such glandular formation as we have seen characterize that of most ovarian cysts. The inner epithelium is flat or low columnar and vibratile.

These cysts, like those of the ovary, may develop in front of or behind the peritoneum. Their content is usually a thin, colorless alkaline fluid that does not coagulate spontaneously, and hardly by heat until an acid is added. It contains a few cells and Bennett's large corpuscles.

Papillary and *dermoid* cysts may also develop in the broad ligament.

As a rule, the cysts of the broad ligaments are sessile; but exceptionally the ligament may form a pedicle, which even may become twisted, an accident that may result in gangrene of the tumor.

They are found in the child-bearing age, grow very slowly, do not impair the general health, and give rise to no symptoms except by their bulk.

Diagnosis.—*Hæmatoma* appears suddenly and may be absorbed. *Ovarian cysts* develop more rapidly, cause more pain, are more sensitive on pressure, and impair the general health. Cysts of the broad ligament offer a marked fluctuation.

Treatment.—Small tumors of this nature should be left alone. When they grow large enough to annoy by their bulk, they should be removed, as an ovarian cyst. Sometimes a pedicle may be formed of the broad ligament. If not, the cyst is enucleated like an intraligamentous ovarian cyst; or, if this is not possible, recourse is had to marsupialization by cutting off as much as possible, stitching the remainder to the edges of the abdominal wound, and packing it, when it will fill by granulation.

If the ovary and tube are healthy, and so situated that they may be left behind, that is the better course to take.

Small cysts of the broad ligament may be removed by anterior colpotomy, for larger ones laparotomy is preferable.

C. SOLID TUMORS OF THE BROAD LIGAMENTS.—*Myomas*, *fibromas*, *lipomas*, and *sarcomas* may form in the broad ligament, and should be removed as soon as the diagnosis is made.

§ 3. Diseases of the Round Ligaments.—Any portion of the round ligament—the intra-abdominal, that passing through the inguinal canal, and that outside of the pelvis—may form a solid tumor—a *myofibroma*, *myxofibroma*, or *sarcoma*. The *diagnosis* may be very difficult. When it is made, the tumor should be removed. (Compare tumors connected with the extrapelvic portion of the round ligament, p. 122.)

§ 4. Diseases of the Sacro-uterine Ligaments.—Not unfre-

quently the sacro-uterine ligaments become *inflamed*, a disease known as *parametritis posterior*.

One or both ligaments become affected. The patient complains of pelvic pain, and on examination the ligament is found swollen and sensitive. Fresh cases yield readily to the usual antiphlogistic treatment. Chronic inflammation may end in cicatricial shortening, which is a cause of ante flexion of the uterus.

These ligaments may lose their tonus and become *elongated*, which leads to prolapse of the uterus. In milder degrees massage and faradization may restore the tonicity. In severer ones an operation for prolapse of the uterus is indicated.

§ 5. **Pelvic Hemorrhage.**—An extravasation of blood from the pelvic organs occurs in three forms: the blood may be poured into the peritoneal cavity without limitation—*intraperitoneal hemorrhage*; it may become walled in by inflammatory exudation—*hæmatocele*; or it may enter the connective tissue of the broad ligaments, the pelvis, and the abdominal wall—*hæmatoma*.

A. INTRAPERITONEAL HEMORRHAGE.—If a large amount of blood flows into the peritoneal cavity, it does not meet any resistance. The intestine is crowded out of the way and the abdominal wall distended.

Etiology.—Such cataclysmic pouring-out of blood is mostly due to injury of the liver or rupture of an aneurism. Gynecological conditions that lead to it are tubal pregnancy, with or without rupture of the tube; rupture of a dilated vein in varicocele or in connection with uterine myoma; rupture of an ovarian cyst; the slipping of the ligature of a pedicle; or adhesions torn in performing laparotomy.

Symptoms.—The patient feels a sudden pain in the abdomen and a flow of a warm fluid in the peritoneal cavity. The pulse becomes weak and rapid, the temperature subnormal. The skin becomes pale, cold, and clammy. The woman feels faint and nauseous, vomits, and gasps for air. Often there is a bloody discharge from the vagina. Consciousness remains clear, so that the patient feels herself dying. Convulsions and death end the scene if the hemorrhage is not speedily arrested.

Treatment.—Laparotomy should be performed at once; clots, a fetus, and fluid blood turned out; and the bleeding point secured by ligature. Often the sac, be it an ovarian cyst or a tube distended by the products of pregnancy, must be removed *in toto*.

B. HÆMATOCELE.—Hæmatocele is an encysted collection of blood in the peritoneal cavity of the pelvis

Pathological Anatomy.—In most cases the blood flows by gravitation into Douglas's pouch. It acts as an irritant, and the intestine and the omentum become glued together and to the pelvic organs, forming a roof over the extravasation. The blood is at first fluid, but coagulates, becomes inspissated, or may be mixed with pus or ichor, or absorbed. The tumor thus formed is, as a rule, situated behind the uterus, which it lifts up and elongates—*retro-uterine hæmatocele*. But the blood may also surround the uterus on all sides—*peri-uterine hæmatocele*; or, if the cul-de-sac of the peritoneum behind the uterus is closed, it may exceptionally collect in front of the uterus and not behind—*ante-uterine hæmatocele*.

Etiology.—Hæmatocele is a rather rare disease. It is found at the period of sexual maturity, generally in persons between 25 and 36 years of age. There are two forms, one due to rupture of an organ, the other to the entrance of menstrual blood in the peritoneal cavity. By far the most common cause is rupture of a tubal pregnancy. Menstrual fluid may regurgitate, not only if the genital canal is closed, but also by lifting heavy burdens, exposure to cold, or coition during the period.

In systemic diseases, like scarlet fever, smallpox, purpura, and icterus gravis, the blood is thin and the walls of the vessels weakened, which may lead to rupture and escape of the blood into the peritoneal cavity.

Symptoms.—There may be *premonitory* symptoms. Thus, if the blood comes from a diseased tube or ovary, there is, as a rule, dysmenorrhœa and pelvic pain. If the genital canal is impervious, the patient has never menstruated or not for a long time, and she may suffer from monthly molimen. In ectopic gestation there are signs of pregnancy, attacks of severe pain, and the passage of decidual shreds. There may have been metrorrhagia and menorrhagia in consequence of some diseased condition of the internal genitals. In other cases the onset is sudden.

Three *stages* may be distinguished. In the first, corresponding to the rupture and extravasation or regurgitation into the pelvic cavity, there is sudden pain and perhaps the other symptoms of internal hemorrhage—faintness, nausea, vomiting, a weak, rapid pulse, dyspnœa, and tympanites. The patient lies immovable on her back. If the attack arises during menstruation, the flow may stop, or, on the other hand, outside of the period, there may appear a bloody discharge from the genitals. The second stage is characterized by signs of inflam-

mation. It begins the following day with a chill, a rise in temperature to from 102° to 104° F., and a pulse acceleration from 100 to 120 beats per minute. When the encystment of the effused blood is accomplished, the pulse and temperature rate return to the normal. The third stage is that of absorption. The coagulated blood is again liquefied and returned into the circulation. But exceptionally the extravasated blood may become purulent or septic. Rupture may occur into the rectum, vagina, bladder, or the general peritoneal cavity. During the absorption there is often a discharge of dark blood from the genitals.

If the amount of blood that has entered the peritoneal cavity is large, it may cause pressure symptoms, such as constipation, dysuria, neuralgia, or œdema of the legs. Sometimes jaundice is developed and the urine contains urobilin.

By vaginal examination is at first felt a soft mass, soon replaced by a tumor extending more or less towards the umbilicus. The examination is best made with one finger in the rectum, one in the vagina, and the other hand on the abdomen. The tumor bulges with a round end into the vagina. Sometimes this and the vaginal portion show marked paleness. The uterus is generally crowded forward against the symphysis; but if the blood collects in front of it, it is tilted backward. Often the sound or probe is needed to find the position of the fundus.

Diagnosis.—The diagnosis is generally not difficult. The general condition of the patient is much better than in free *intraperitoneal hemorrhage*. *Hæmatoma* does not form so large a tumor, is not accompanied by bloody discharge, is lateral, and crowds the uterus to the opposite side. *Pelvipерitonitis* begins with fever, while in *hæmatocele* it comes the next day. The tumor is slower to harden. It is often situated more laterally. But in the third stage it may be impossible to distinguish them from each other. A *retroflexed gravid uterus* is accompanied by signs of pregnancy, the cervix and lower uterine segment are soft, and an angle is felt between the two. *Ectopic gestation* is characterized by signs of pregnancy combined with those peculiar to extra-uterine pregnancy. It is often found as the underlying cause of the *hæmatocele*.

Prognosis.—The prognosis is much more favorable than in cases of unlimited hemorrhage, but the absorption may take from three weeks to six months. A few cases end fatally through rupture into the peritoneal cavity. That into the rectum may lead to sepsis, which exhausts the strength of the patient.

Treatment.—In the first stage the patient must be kept absolutely quiet, with the head low. An ice-bag is placed on the abdomen, and opium given *pro re nata*. A colpeurynter filled with ice-water may be placed in the vagina and ice-water injected into the rectum, unless the patient is too weak to support the depressing effect of the cold, when very hot water may be used instead. In the second stage these measures are continued. In the third absorption should be favored by the use of Priesnitz's compress, painting with tincture of iodine on the skin and the vaginal roof, and the application of ichthyol, blue ointment, or the galvanic current. The vagina should be kept clean by means of antiseptic injections.

Operative interference is contraindicated in the beginning. Even a puncture with a hypodermic syringe may cause fatal sepsis. If later the tumor softens and the patient has chills, high temperature, frequent pulse, pain in the loins and legs, that condition denotes suppuration, when the cavity should be opened and drained. A transverse incision is made into Douglas's pouch and dilated with Garrigues's expanding perforator. The cavity is washed out with a copious amount of antiseptic fluid. If there is any bleeding, the hollow is packed with iodoform gauze for forty-eight hours. Otherwise a sky-rocket drainage-tube is fastened to the edges. Once or twice a day mild antiseptic injections, such as solutions of thymol or boric acid, or Thiersch's solution, are made into the sac, for which later is substituted tincture of iodine of increasing strength, beginning with a teaspoonful to a pint.

If suppuration continues after rupture into the rectum, it is better to make a counteropening in the vagina and insert a drainage-tube.

If the absorption is unduly slow and has not made much headway in a month, it is also indicated to open and drain the cavity. The same holds good in cases of repeated relapse; but then there may be expected some bleeding, and the cavity is therefore packed tightly with iodoform gauze, which may be retained for a week.

If the extravasation cannot be reached from the vagina, laparotomy takes the place of colpotomy, but is much more dangerous. There is a *subperitoneal* and a *transperitoneal method*. In the former an incision is made above and parallel to Poupart's ligament, and the peritoneum is lifted until an incision can be made into the sac without opening the peritoneal cavity. If this is done accidentally, the wound should be packed with iodoform gauze and left alone for twenty-four hours, by which time adhesions have formed. When the blood-cavity has

been opened, a counteropening is made in the vagina and through-drainage established.

Transperitoneal laparotomy is performed in the median line. If possible, the sac should be stitched to the abdominal wall; but if there is no sac that allows sewing, the cavity must be washed out and drained through the abdominal wound.

C. HÆMATOMA.—Pelvic hæmatoma is a collection of blood in the connective tissue of the pelvis, above the levator ani muscle, most frequently between the layers of the broad ligament, whence it may extend between the pelvic peritoneum and the fascia up on the abdominal wall as far as the kidneys or down along the side of the vagina.

Pathological Anatomy.—Generally the collection is of small dimensions, but exceptionally it may contain several pints of blood, and form a tumor that nearly reaches the umbilicus. It is commonly unilateral, but may develop in both ligaments, and then there often is a uniting bridge in front or behind the uterus or in both places; or there is a large retro-uterine hæmatoma (Figs. 306–309).

The flow is checked by the resistance offered by the surrounding sac, and the blood does not coagulate so rapidly as in hæmatocele. The irritation of the peritoneum may produce some peritonitis. The sac may rupture, when a secondary hæmatocele is developed; or the blood may become purulent, forming a pelvic abscess.

Etiology.—Pregnancy and childbirth loosen and weaken the pelvic connective tissue and thus predispose to the formation of a hæmatoma. Varicocele and the sac in tubal pregnancy may rupture in such a place that the blood enters the broad ligament. Venereal excesses may lead to hæmatoma through stasis of blood.

Symptoms.—The symptoms are much like those of hæmatocele, but less marked. The patient is seized with sudden pain in the pelvis, and the pulse becomes rapid and weak. The vagina and even the skin may be bluish. A doughy tumor is felt on one or both sides of the uterus. If the affection is unilateral, it crowds the uterus to the other side. If it is bilateral, it lifts the uterus and draws it out lengthwise. The tumor may form also a large mass or a bridge behind the uterus or a bridge in front of it. As a rule, it does not rise beyond the pelvic brim, but exceptionally it may reach the umbilicus. Sometimes it is distinctly fluctuating.

Diagnosis.—The effusion takes place more slowly, causes less pain and shock, and forms a distinct tumor sooner than in hæmatocele.

Hæmatocele is mostly found behind the uterus, hæmatoma to its sides. Sometimes the shape of the tumor may be characteristic; the upper surface being convex and the lower concave, so that the whole

FIG. 307.

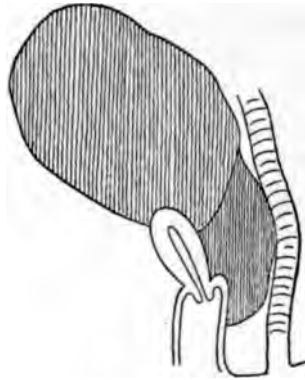


FIG. 306.

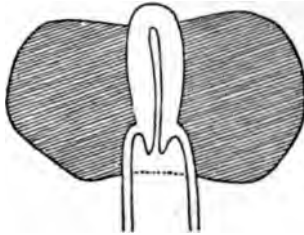


FIG. 309.

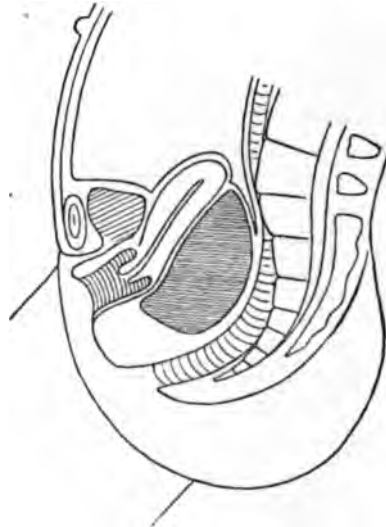
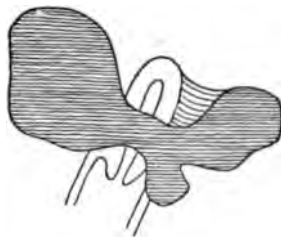


FIG. 308.



Pelvic hæmatoma. (Rosthorn.) Fig. 306, hæmatoma of both ligaments and behind the uterus; Fig. 307, large bilateral and retro-uterine hæmatoma; Fig. 308, hæmatoma of both broad ligaments, united by a bridge in front of the uterus; Fig. 309, hæmatoma of left broad ligament and behind the uterus.

mass is like a jelly-fish. A ring surrounding the rectum is also peculiar. Hæmatoma may extend to the vaginal entrance, while the

tumor formed by hæmatocele is situated at the roof of the vagina. The uterus becomes immobile sooner in hæmatoma and the contents of the tumor remain fluid longer. Fever occurs later. In *cellulitis* fever precedes the development of the tumor, the uterus is not immobilized so early, and there is a history of childbirth, abortion, or the performance of some operation on the uterus.

Prognosis.—The prognosis is better than in other kinds of pelvic hemorrhage, but the sac may rupture into the peritoneal cavity or the blood become mixed with pus.

Treatment.—As a rule, the case should be treated with rest, an

FIG. 310.



Mesial section of the pelvis. The heavy black line indicates the peritoneum; a, rectum; b, vagina; c, bladder; d, uterus; e, bottom of Douglas's pouch; f, symphysis pubis.

ice-bag, and opiates. But if there are signs of suppuration, or if it resists absorption too long, the cavity should be opened and drained like a hæmatocele.

§ 6. *Perimetric Inflammation.*—Perimetric inflammation is a general term comprising that of the peritoneum, the connective tissue, the veins, the lymphatics, and the lymph-glands of the pelvis.

A. *PELVIC PERITONITIS.*—By pelvic peritonitis is understood the inflammation of that portion of the peritoneum which covers the uterus, the tubes, the vagina, and the walls of the pelvis, and forms the broad ligaments (Fig. 221, p. 254; Fig. 310).

Of all the perimetric inflammations peritonitis is by far the most

common. It is sometimes called *perimetritis*. It may be *acute* or *chronic*.

Pathological Anatomy.—In nearly all cases the tubes are diseased, and often the ovaries, too. The peritoneum becomes injected, it loses its endothelium, and serum is secreted from the denuded surface. The neighboring organs are agglutinated by a yellow fibrinous mass, that becomes organized and forms a *false membrane*, which encysts the serous exudation. This is, as a rule, found behind the uterus or the broad ligament. It may be reabsorbed or form permanent adhesions. Rarely it becomes mixed with blood or pus. In other cases, especially those of gonorrhœal origin, the exudate is purulent from the beginning. Gonococci travel along the mucous membrane of the uterus and tube, while staphylococci and streptococci take the shorter way through the lymph-vessels. False membranes consist of connective tissue interspersed with small round cells, and not rarely miliary abscesses.

In other cases there is little fluid, the inflammation being more dry—*adhesive peritonitis*.

Pus in the pelvis may be found in the tube (*pyosalpinx*), in the ovary (*ovarian abscess*), in the peritoneal cavity (*suppurative peritonitis*), or in the connective tissue (*cellulitis*), and sometimes in several or all these places at once. Even when found in the peritoneal cavity, it is walled off by adhesive inflammation. This abscess is liable to break into the rectum, the vagina, the bladder; through the skin above or below Poupart's ligament; or in the region of the great sacrosciatic foramen. Rarely the rupture takes place into the general peritoneal cavity. Often the abscess is evacuated through a long, devious canal, and may then refill from time to time.

Etiology.—Pelvic peritonitis may be congenital. In adults it is generally added to other diseases, especially salpingitis. Metritis, displacements, myomas, and cancer are often accompanied by it. It may be due to the rupture of a hæmatoma or tubal pregnancy. In hæmatocoele its action is life-saving by limiting the extravasation of blood. Tubercular peritonitis is generally propagated from the tuberculous affection of the tube. A chief cause is gonorrhœa. Peritonitis is often due to gynecological operations, such as the passing of a sound, curettage, trachelorrhaphy, if antisepsis and asepsis are defective. Childbirth or abortion may be followed by it. Suppression of menses by exposure or copulation during menstruation often lead to it. Perhaps also masturbation may give rise to it.

Symptoms.—*Acute* pelvic peritonitis is ushered in by a sudden severe pain in one side of the pelvis, which may extend to the other or down the anterior surface of the thigh. The patient feels faint and nauseated, and sometimes vomits. Generally she has a chill, the temperature rises, and the pulse becomes accelerated. Often she complains of vesical and rectal tenesmus. Her features become pinched and anxious. She may become delirious. The abdomen is distended and sensitive. Often there is a bloody discharge from the uterus. By vaginal examination is found behind the uterus or to one side of it an exquisitely tender swelling that crowds the uterus forward against the symphysis or over to the other side, at the same time canting its edge forward. It is immovable. Sometimes crepitation is heard and felt, but the tension is too great to allow fluctuation.

As a rule, this tumor becomes smaller and smaller, and finally disappears. The uterus may resume its normal mobility or it may continue bound by adhesions. If the contents become purulent, there are renewed fever, chills, night-sweats, and a yellowish hue of the skin.

In septic cases the temperature is sometimes even subnormal or may alternately be high or low. Pain and swelling may be absent. On account of accompanying œdema the tumor may vary in size or position. It may be as small as a pigeon's egg or extend far into the abdomen.

The *chronic* peritonitis may be so from the beginning, but it is oftener a series of acute attacks brought about by bodily exertion, trickling of fluid from the Fallopian tube, or rupture of a follicular cyst or a distended tube. In the chronic form the inflammation has a more adhesive character. The patient is often able to be out of bed and even to do some housework, but she has constant pelvic pain with exacerbations at the monthly periods. By bimanual examination the above-described tumor is felt. Prostitutes often suffer from a condition known as *colica scortorum*, which probably is partly due to small attacks of local peritonitis, partly to painful contraction or distortion of the tubes.

Diagnosis.—Sometimes it may not be possible to differentiate pelvic peritonitis from similar conditions, but in most cases the diagnosis is not difficult. In a fresh case, where the patient has pain and fever, and we feel Douglas's pouch filled with a sensitive exudation pressing the uterus against the symphysis, the nature of the affection is clear. *Hæmatocoele* is found in the same position, but begins more

suddenly and violently, and the extravasated blood is at first fluid and coagulates later, whereas in peritonitis the tumor is harder in the beginning and becomes softer when more serum is poured into it.

In *cellulitis* the onset is less severe and the tumor is felt close to the edge of the uterus, which it crowds to the opposite side inclusive of the cervix. There may be two tumors, one on either side, connected in front and behind. In peritonitis the whole vaginal roof presents one hard, smooth mass. In cellulitis the uterus preserves more mobility than in peritonitis. If cellulitis extends above the brim, it always follows the bone closely, while in peritonitis the boundary of the tumor lies further in, so that the finger-tips can be inserted between it and the wall of the pelvis. If cellulitis involves the psoas and iliac muscles on one side, relief is felt by bending the corresponding extremity, while in peritonitis both lower extremities must be bent to obtain the same effect. In *chronic oophoritis* the ovary may be movable, it is smaller, and is recognizable by its contour. *Salpingitis* forms a sausage-shaped tumor and is often bilateral; but the tube may become so distended with pus that it fills the whole pelvis, when it is impossible to decide whether the fluid is situated directly in the peritoneal cavity or enclosed within the walls of the oviduct.

In *ectopic gestation* there are signs of pregnancy and the tumor is placed at the side of the uterus. *Myoma* is a chronic disease, forming hard, nodular, insensible masses. The uterus is generally movable and the tumor follows its movements. There is no fever. The uterine cavity is usually deeper than normal. An old encysted peritonitis may be mistaken for an *ovarian cyst*, but there is a history of an acute inflammatory beginning. If an explorative puncture is made, the fluid is citrine serum containing leucocytes, entirely different from ovarian fluid. A *cyst of the broad ligament* or a *hydatid* develops very slowly, and the fluid is different. In *tubercular* peritonitis the lungs are generally affected. In *oophoralgia* there is neither tumor nor inflammation.

Prognosis.—The prognosis depends chiefly on the cause. Traumatic or menstrual peritonitis, as a rule, ends in recovery in short time. The gonorrhœal never becomes general, but may lead to chronic invalidism, and may even become fatal from exhaustion or tuberculization. The puerperal form is very grave.

Often recovery is incomplete. Uterine displacements may develop. Hæmatoma may form in the adhesions. Pressure on the rectum or

the bladder may cause constipation or dysuria. Sterility or abortion is common.

Treatment.—The prophylaxis is the same as for salpingitis (p. 308). In regard to curative treatment, the patient must lie quietly in bed and be kept on fluid diet. A bolster is laid under the bent knees, and an ice-bag or a coil with running ice-water on her abdomen. Pain is subdued by opiates. Three times a day is given a hot vaginal douche, to which in infectious cases some antiseptic should be added. The bowels should be kept open with saline aperients, or if they cause vomiting, calomel (1 grain—6 centigrammes—every hour till effective), and enemas. Quinine as a tonic and antiphlogistic remedy is given in 5-grain doses every 4 hours.

When after 8 or 10 days the inflammation takes a more subacute course, the ice-bag is replaced by a Priessnitz compress and the patient is allowed more nourishing food. A few days or a week later the abdomen should be painted with tincture of iodine and covered with a compress soaked in carbolized water with glycerin (p. 76). When the sensitiveness has abated sufficiently to allow the introduction of a speculum, the iodine should be used on the vaginal roof 2 or 3 times a week. A pledget with ichthyol glycerin is placed against the vaginal roof twice a day and the hot douche continued. Ichthyol ointment (10 per cent.), may also be used for inunction of the abdomen. Iodide of potassium by the mouth may contribute to the absorption of the exudate.

At the end of three weeks the patient will probably be able to get up and spend most of the day on a lounge. When she is able to walk, the time has come for the galvanic current, with the negative pole against the vaginal roof, massage, sitz baths, warm entire baths, hot-air treatment, or mineral mud baths. If serous pseudocysts remain after the acute symptoms have vanished, much time may be saved by aspiration; but the utmost caution should be used in disinfecting the vagina and the instruments, lest one change a harmless serous exudation into an abscess. The puncture should be made behind the uterus and not more than an inch out from the median line.

In chronic peritonitis or the last stages of the acute, the patient may take moderate exercise and should have nutritious food and tonic remedies. Sexual intercourse should be avoided or restricted as much as possible. An abdominal supporter sometimes contributes to the patient's comfort.

If the contents of the inflammatory tumor become purulent, a transverse incision should be made behind the cervix, the tissues

separated bluntly, the abscess wall perforated with Garrigues's dull expanding perforator, followed, if the abscess is very large, by Bischoff's dilator. If there is any bleeding, the cavity is packed with iodoform gauze or plain gauze. On the third day this is replaced by a double-current drainage-tube with cross-bar. If there is no bleeding, a sky-rocket drainage-tube is fastened with sutures to the edges of the opening. Through these tubes antiseptic fluid is injected daily. After their removal the cavity is injected through a double-current catheter. The best fluid is then tincture of iodine, a teaspoonful to a pint of water, increasing the strength gradually till all discharge ceases.

If the abscess points near Poupart's ligament, the incision should be made there, above and parallel to the ligament, and a counter-opening should be made in the vagina. A rubber tube with side-holes is carried through and used for drainage and injection.

If the abscess communicates with the rectum, a strongly-curved sound should be introduced through the opening and a counter-incision made in the vagina or at the groin. If the rectal fistula cannot be found, the opening is made without the aid of the sound. A winged drainage-tube is put in and the cavity irrigated daily.

If the abscess extends above the crest of the ilium, a perpendicular incision is made in Petit's triangle, midway between the anterior and posterior superior spines of the ilium, between the latissimus dorsi and obliquus abdominis externus muscles, which leads to the outer edge of the quadratus lumborum muscle.

If there is reason to believe that the appendages on one side are affected, they may be removed from the vagina or by laparotomy. If both sides are affected, the operation is begun by vaginal hysterectomy; and if the appendages cannot be removed, they are incised and drained through the vagina. This method presents the advantage over laparotomy that the protecting roof which nature has placed between the abscess and the general peritoneal cavity need, perhaps, not be broken. But it is not always possible to remove the uterus completely, and still less the appendages.

If the abscess communicates with the *bladder*, a counteropening may be made in this organ either by suprapubic incision or from the vagina; but sometimes simple washing-out of the bladder with mild antiseptics suffices to close the fistula.

If the abscess opens into the *ureter*, it may, perhaps, be possible to make an anastomosis between the two ends, or to implant the upper end into the bladder.

After an abscess has been opened and drained, the surrounding induration soon disappears.

If the abscess is adherent to the anterior abdominal wall, a vertical incision is made over the most prominent point. If possible, a counteropening is made in the vagina and through-drainage established.

If a fistulous tract remains after an abscess, it must be dilated with laminaria tents or the knife, curetted, and injected daily with irritating fluids, such as peroxide of hydrogen, carbolyzed water (2 per cent.), liq. sodæ chloratæ (diluted with 8 or 10 times as much water), Villate's solution (R. Cupri sulphatis, zinci sulphatis, āā 15; liq. plumbi subacetatis, 30; aceti, 200, M.) mixed with twice as much water, tincture of iodine diluted with 10 parts of water, or subnitrate of silver solution (2 per cent.). Sometimes the whole fistula can be cut out and the edges united with suture.

Adhesions may cause such pain that the patient is unable to work. Then great relief or a complete cure is sometimes effected by performing laparotomy and severing them. If large denuded surfaces are left, it is better to cover them with Cargile membrane, kept in place with a few sutures.

B. PELVIC CELLULITIS.—Pelvic cellulitis is the inflammation of the connective tissue in the pelvis above the pelvic diaphragm. It is particularly found in the broad ligaments, the surroundings of the cervix, and the sacro-uterine ligaments.

Cellulitis was more common formerly when surgery and obstetrics had not adopted antiseptic and aseptic precautions. It may be *acute* or *chronic*.

Acute cellulitis may arise from a tear in the cervix extending into the parametrium, spread from the interior of the uterus, or originate in the depth of bruised tissue. Generally it is combined with peritonitis, lymphangitis, or phlebitis. It is, as a rule, unilateral.

It may be *traumatic* or *septic*. Both are caused by germs, but the former is due to simple saprophytes, the latter to pathogenic microbes. Either of them may be *puerperal* or *non-puerperal*. The traumatic spreads in the loose connective tissue lying between the denser membranes; the septic does not respect any boundary.

First, there is a stage of *infiltration*, which may end in *resolution*, *induration*, or *suppuration*. Of all pelvic inflammations, cellulitis is the one most prone to terminate in suppuration. The pus spreads, and the abscess may open in a way similar to that followed by an

intraperitoneal one; but while the puerperal form has a tendency to break through the skin, the non-puerperal form usually opens into one of the hollow organs. Rupture into the peritoneal cavity is rare.

Cellulitis may end in cicatricial retraction, causing uterine displacement. Indurated tissue is apt to suppurate after a long time.

Chronic cellulitis may be a sequel to the acute form, or may have the chronic type from the beginning.

Etiology.—Puerperal cellulitis is often due to a tear of the cervix; to different obstetric operations; or to inflammation of the uterus tubes, or ovaries. The non-puerperal is brought about by the use of tents, operations on the cervix, or enucleation of tumors. A hæmatoma may suppurate. Cellulitis may originate also in exposure to cold. *Parametritis posterior*, or cellulitis of the sacro-uterine ligaments, may arise from constipation, with hard scybala.

Symptoms.—The symptoms are much like those of peritonitis. The patient may have a chill; there is a rise in temperature; the pulse is accelerated; she has pain in the lower part of the abdomen and, perhaps, vesical and rectal tenesmus; she has no appetite; and her tongue is furred. But the pain does not come on so suddenly as in peritonitis, and is not so severe. There is less tendency to vomiting, and no meteorismus. By vaginal examination we find the vagina hot, swollen, and tender. If the seat of the inflammation is in the broad ligament, we find at the side of the uterus a tumor that is sensitive on pressure and crowds the uterus to the opposite side. If both ligaments are inflamed, the uterus is lifted up. If the sacro-uterine ligaments are inflamed, we feel one or both folds at the top of Douglas's pouch swollen and sensitive. More rarely the swelling is situated behind or in front of the uterus. If the affection extends into the iliac fossa, the corresponding leg is drawn up.

If the tissue suppurates, the swelling becomes softer, but rarely distinctly fluctuating, and there is an increase in the fever. Induration may last many months.

An attack of parametritis posterior is often followed by irritability of the bladder. This may be explained by cicatricial shortening of these ligaments, which pull on the uterus at the level of the internal os, and indirectly on the base of the bladder, which is fastened to the cervix. Other sequels may be amenorrhœa, menorrhagia, or dysmenorrhœa.

Diagnosis.—In *pelvic peritonitis* the onset is more sudden and violent; there is vomiting and meteorismus. The tumor usually develops

behind the uterus. If it extends above the pelvic brim, it is not situated so close to the bone. *Hæmatoma* begins suddenly with great pain, but without fever. An *ovarian tumor* is generally movable. *Uterine myoma* develops slowly, and forms one continuous mass with the uterus, which is movable. *Retroperitoneal sarcoma* is a chronic malignant disease, which undermines the constitution.

Prognosis.—The prognosis is better than in peritonitis. It is even good as to life, but uncertain as to duration and complete recovery.

Treatment.—The treatment is the same as for peritonitis (p. 366). The chief prophylaxis consists in antiseptic and aseptic obstetrics and gynecology. The patient should beware also of exposure to cold. The ice-bag or coil used in peritonitis may be replaced by a continuous irrigation of the vagina with ice-water by means of Frost's vaginal syringe (Fig. 311). If pus begins to form, the maturation of the ab-

FIG. 311.



Frost's vaginal syringe.

scuss should be furthered by warm linseed-meal poultices and hot vaginal injections. If liquefaction takes place in different foci, they should, as a rule, be given time to combine before opening the abscess.

An abscess in the broad ligament may sometimes be reached by posterior colpotomy without entering the peritoneal cavity. But, if necessary, the cavity is entered and the abscess perforated with Gargues's dull expanding dilator. An abscess between the cervix and the bladder must be approached very carefully by anterior transverse colpotomy. Once open, the cavity is drained with gauze or rubber tubes.

CHRONIC ATROPHYING CELLULITIS.—This disease consists in a cirrhotic contraction and hardening of the connective tissue. There is a *circumscribed* form, situated at the level of the superior sphincter of the rectum, and a *diffuse*, implicating the connective tissue of the whole pelvis. The circumscribed is due to ulcers in the bladder or

the rectum, laceration of the cervix, or chronic metritis. The diffuse arises from similar causes or from too great or too frequent sexual excitement, especially masturbation. Chlorotic women with hypoplasia of the genitals and the circulatory system are particularly predisposed to it.

Symptoms.—The patients are indifferent or even averse to normal sexual intercourse, while they have a tendency to masturbation. They have erotic dreams, with emission of mucus. They complain of pain in the iliac fossa, painful defecation, micturition, and menstruation, and often of intermenstrual pain. They are always hysterical and suffer often from *copiopia hysterica*, a painful affection of the eyes.

Prognosis.—The circumscribed form may be cured by removing the cause. The diffuse is incurable.

Treatment.—The diseases that cause it must be cured, vaginal cicatrices incised or cut out. The reflex neuroses are treated with subnitrate of bismuth, nitrate of silver, acetate of zinc, ammonia, castoreum, and valerian. During the hysterical attack nothing should be done, as all interference only serves to make the condition worse.

C. PELVIC PHLEBITIS.—The inflammation of the pelvic veins is, outside of puerperal cases, a very rare disease. The puerperal form begins from the inner coat of the vein which is in contact with a thrombus. In the non-puerperal form the inflammation begins as periphlebitis, which is secondary to cellulitis. These two affections are intimately connected and cannot be clinically differentiated.

D. PELVIC LYMPHANGITIS AND LYMPHADENITIS.—The lymphatics of the vulva and lower third of the vagina connect with the superficial inguinal glands, which communicate with the deep inguinal and external iliac glands. The lymph-vessels of the upper two-thirds of the vagina and cervix terminate in the internal iliac and the sacral glands. Those from the body and the fundus extend to the lumbar glands. The chief vessels follow the edges of the broad ligament. (Fig. 312).

The inflammation may extend from any part of the genital tract to the broad ligaments, causing lymphangitis, cellulitis, and peritonitis.

Outside of the puerperium¹ lymphangitis is rare. It is either acute or chronic, generally the latter.

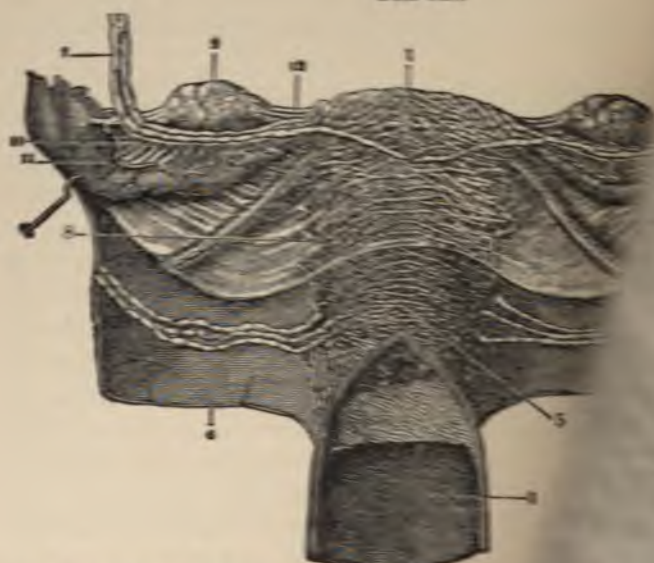
Etiology.—Lymphangitis originates in endometritis. Lymphade-

¹ Garrigues, "A Text-book of Obstetrics," 1902, pp. 704, 710, 737.

ritis may be due also to syphilis or scrofulosis, when it is combined with adenitis in other parts of the body.

Symptoms.—The patient complains of a deep-seated pelvic extending to the pubes, the obturator canal, or the coccyx, sensitiveness, rendering cohabitation painful. She has no fever; parametrium is tender, but there is no effusion. The uterus is mobile, but movements cause pain. It is enlarged and tender; ovaries are in a similar condition. To the sides of the uterus

FIG. 322.



The lymphatics of the uterus. (Poirier.) 1, lymphatics along the uterus; 2, ovary; 3, vagina; 4, Fallopian tube; 5, lymphatics extending from the cervix to the iliac glands; 6, lymphatics extending to the lumbar glands; 7, anastomosis between cervical and uterine lymphatics; 8, lymph-vessels carrying the ovarian ligament.

small sensitive tumors, ranging in size from a few grains to a somewhat mobile, or a bunch of movable worms. The tumors are probably located in the parametrium or perilymphatic cellulitis, and the worms are the lymphatic vessels.

Treatment.—If the patient is scrofulous, she must first have the corresponding general treatment, and then be treated as described above.

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nes, "Obstetrics," 1902, p. 262, *et seq.*

be given internally three times a day. If there is only one or a few pelvic tumors, they may be incised and drained from the vagina. Electrolysis may perhaps kill the animal. If the tumor rises into the abdominal cavity, laparotomy should be performed and the cyst enucleated. The cavity left is treated as after enucleation of other tumors. If the whole cyst cannot be removed, the edges of the remaining portion are stitched to those of the abdominal wall and the cavity packed with iodoform gauze. If the tumor ruptures through the skin, the opening should be enlarged and, if possible, a counter-opening made.

CHAPTER VIII

STERILITY

FECUNDATION consists in the union of the male and female sexual elements, the spermatozoid and the ovum. Many circumstances may prevent this union, or, if it takes place, prevent the development that results in the formation of a fetus.

The premature expulsion of the fetus by abortion is discussed in works of obstetrics.¹ Here we have to deal only with *sterility*, or *barrenness*,—that is, the lack of capacity for impregnation or conception.

One marriage out of every eight is childless. The cause of this, apart from cases in which conception is arbitrarily prevented, may be found either in the husband or in the wife.

Sterility in the Male.—The lack of power of reproduction in man may be due to *impotence*,—that is, incapacity of copulation; to *aspermatisms*,—that is, the absence of ejaculation; or to *azoöspemia*, the condition in which the sexual act ends in the ejaculation of a mucous fluid, which does not contain any spermatozooids. This is generally the result of *latent gonorrhœa*. A man may have had a gonorrhœa many years ago which apparently was cured. Still a careful examination of his urethra reveals that there is a stricture behind which lurks a minute quantity of pus. His urine contains “tripper-faden,” and his wife remains sterile and suffers from acute or chronic inflammation of the genital tract, inclusive of the adjacent peritoneum.

Sterility of the Female.—Much more frequently the cause of barren marriages is found in the woman. Before puberty and after the climacteric sterility is normal in her. Her sexual tract being so much longer and more complicated, it is more apt to harbor conditions which prevent fecundation. Sterility may be *primary* or *secondary*. It is called primary, if the woman, in spite of frequent intercourse, never conceives, while it is denominated secondary, if she gives birth to one or two children and then ceases to be fecundated.

The patient may not have any ova, or she may be incapable of copulation, of conception, or of gestation.

1. *Absence of Ova.*—If there are no ova, conception is an impossibility, which cannot be remedied. Such absence may, perhaps, be

¹ Garrigues, “Obstetrics,” 1902, p. 262, *et seq.*

congenital, and is a common sequel of chronic inflammation of the ovaries.

2. *Incapacity for Copulation*.—This may be mechanical or nervous.

(a) *Mechanical incapacity*.—This may either be *absolute*, as in cases of closure of the genital canal; or *relative*,—that is, opposing a more or less considerable obstacle to the perfect sexual union, such as tumors of the vulva or vagina.

(b) *Nervous incapacity* is especially due to vaginismus.

3. *Incapacity for conception* may be either *local* or *constitutional*.

(a) The local incapacity for conception, may be *absolute*, for instance, if the patient has no uterus; or *relative*, as when it contains myomatous tumors. The Fallopian tubes may be impervious or they may only by their contortions oppose a hindrance to the free movements of the ova and spermatozooids. We have already said that the ovaries may be without ova, and in other cases they are so densely covered with adhesions that the ova cannot escape.

(b) *Constitutional Incapacity*.—Anæmia is a frequent cause of sterility. Great obesity leads often to barrenness. Tuberculosis, syphilis, and cancer impair fecundity in a marked degree. Too frequent connection has a similar effect.

4. *Incapacity for Gestation*.—Certain conditions, above all endometritis, offer poor chances for the embedding and development of the ovum. It may even be washed out by hemorrhage or leucorrhœa before it is embedded, perhaps even before it is fertilized.

Diagnosis.—Fecundity depending on the union of microscopical elements produced by the male and the female, the search for the cause of sterility should not be limited to the woman, but must needs be extended to or might even properly begin with the husband. He should be questioned in regard to his potency and the ejaculation of semen and asked whether at any time of his life he has had gonorrhœa or syphilis. If he has had gonorrhœa, his urethra should be examined with olive-pointed bougies to ascertain whether he has any stricture and whether his urethra contains any pus. For the latter investigation an endoscopic examination is also called for. If his urine contains threads, they should be examined microscopically for pus-corpuscles and microbes. The normal condition of his penis, especially the place of the meatus, and of his testicles should be ascertained by inspection and palpation. If there is the slightest discharge, that should be scrutinized. Finally, his semen should be examined microscopically. The proper way of obtaining it is to direct the man

to use a condom, and immediately after connection with his wife place it in a wide-mouthed bottle and bring it to the physician. If it is found full of lively spermatozoids, and the man otherwise is found normal, he may be looked upon as not responsible for his barren marriage.

The woman should be subjected to a complete bimanual examination, which should be particularly directed against any malformation or the presence of any disease that is known to hinder or prevent pregnancy. The fluid secreted by the genital canal should be tested with litmus paper. That of the vagina is normally acid, but may be so in such a degree that it kills the spermatozoids. That from the uterus may be obtained by using a speculum. It is normally alkaline and, if acid, is deleterious to the spermatozoids. The discharge should also be examined microscopically to see if it contains any pus-corpuscles.

Treatment.—What is to be done for the man is discussed in works on genito-urinary diseases. Before beginning any treatment for sterility, the concerned parties should have a little patience. Conception does not always take place immediately, even when both husband and wife are entirely normal in every respect. A certain adaptation is often required. But statistics show that three-fourths of married women within a year give birth to a child, and if they remain sterile for three years, it is rare that they get any. As a practical rule, it may, therefore, be said that if a woman does not become pregnant in the course of the first year after her marriage and is desirous to have offspring, the case should be submitted to medical investigation.

The entrance of the spermatozoids into the cervix may be furthered by elevating the pelvis during copulation or, if the os is situated too far forward, by performing the act *modo brutorum*. It has been noticed that travelling has a marked effect in furthering conception, which probably is due more to the change of couches than to that of climate.

The rule for special treatment is to remove the cause as far as possible. Anæmia is combated with chalybeates, carnogen, arsenic, and albuminoid food. Adipose tissue is reduced by iodine, phyto-lacca, fucus marina, massage, exercise, Turkish baths, and avoidance of fattening food.¹ A too small uterus may sometimes be enlarged

¹ The *menu* should be made up of beef, mutton, veal, game, poultry, eggs, fish, lobsters, crawfish, crabs, shrimps, oysters, clams, scallops, mussels, cheese, green vegetables, lettuce-salad without oil, and a small amount of juicy fruit, with a pint of claret or Moselle wine, a cup of black coffee, a cup of tea without milk, and only four ounces of bread per day. Forbidden are soups, water, milk, beer, potatoes, beets, puddings, pies, sweetmeats, and candy.

by means of the galvanic current, with the negative pole in the uterus.

Operative interference has often an excellent effect. A resistant or supersensitive hymen may have to be removed, a painful urethral caruncle destroyed, a vagina made, an elongated cervix amputated, a crooked or narrow cervical canal straightened or dilated, a polypus cut off, a diseased endometrium curetted, etc. Sometimes the repair of a torn perineum or lacerated cervix has the effect of curing secondary sterility.

If all other means fail, or the patient refuses any kind of cutting operation, as a last resort *artificial impregnation* may be tried, but rarely proves successful. The operation is very simple. The husband has intercourse with his wife, using a condom, which he brings to the physician waiting in another room and having in readiness an intra-uterine syringe properly disinfected and kept warm. He draws up a little of the semen with the syringe, exposes the os with a speculum, the patient lying on her back. He also cleans the orifice with some antiseptic solution. Next, he introduces the syringe up to the fundus and expresses a few drops into the cavity of the uterus. The patient should remain in bed that day, and if she feels any pain, an ice-bag should be placed on the hypogastric region. The most favorable time for trying artificial fertilization is immediately before an expected menstruation. If the first attempt remains fruitless, the operation may be repeated several times, with four weeks' interval.

Lack of Orgasm.—It is not rare that women complain of absence of the thrill normally constituting the acme of sexual excitement. This condition may be *primary* or *secondary*. It is primary if the normal satisfaction has never been felt, which is probably due to some congenital imperfection in the nervous system. It is secondary if the normal sensation has been experienced before, but has ceased to be produced.

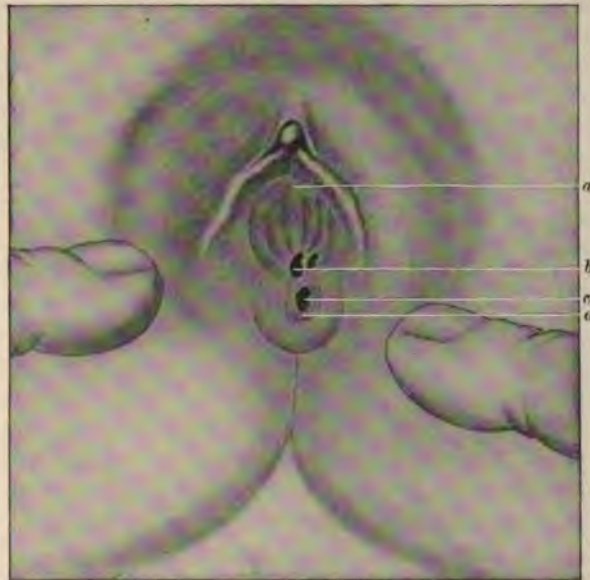
The primary form is incurable and in the secondary variety the prognosis is not much better. A general toning up of the nervous system by iron, arsenic, phosphorus, strychnia, and sea baths, as well as aphrodisiacs, such as damiana and tinctura cantharidis, should be tried.

CHAPTER IX

DISEASES OF THE URETHRA

§ 1. **Malformation.**—1. **HYPOSPADIAS** (Fig. 313).—By an arrest of development the posterior, or inferior, wall of the urethra may fail more or less completely to unite. If the gap goes in deep enough to implicate all the little muscles forming urethral sphincters, the patient cannot retain her urine. These sphincters are partially the compressor urethræ muscle between the two layers of the triangular liga-

FIG. 313.



Hypospadias. (Mosengeil) *a*, anterior wall of the urethra; *b*, posterior, closed part of the urethra; *c*, entrance to the vagina; *d*, hymen.

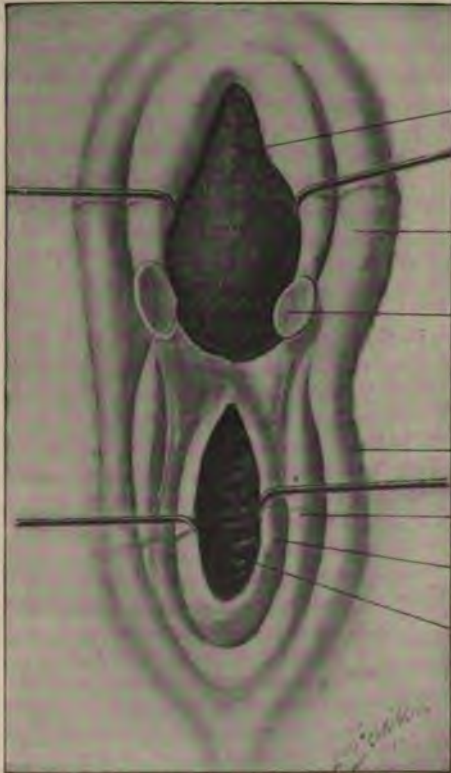
ment and partially a narrow muscular belt surrounding the urethra and the vagina together just behind the vestibulovaginal bulbs. The incontinence may be ameliorated by denuding and uniting two narrow surfaces at the site of the split urethra (Fig. 106, p. 95).

2. **EPISPADIAS** (Fig. 314).—This is an anomaly in which the anterior, or superior, wall of the urethra is not united. It is often combined with separation of the pubic bones, scission of the clitoris, and

absence of the anterior wall of the bladder—so-called *extrophy*. These defects are all due to an arrest of development of the anterior wall of the intracorporeal part of the atlantois and the abdominal wall.

Treatment.—The split in the urethra may be closed by taking a flap from the vestibule and stitching it to the edges of the urethra, or by making lateral denudations and uniting the pared surfaces above the urethral canal.

FIG. 314.



Epispadias. (Kleinwächter.) a, open bladder; b, labium majus; c, split clitoris; d, labium minus; e, hymen; f, entrance to vagina.

3. ATRESIA.—It happens often that newborn children cannot urinate because the epithelium of the walls of the urethra sticks together like the leaves in a new book.¹ But in rare cases there may be a real obstruction due to defective tunnelling. There may be a transverse membrane closing the lumen or a fibrous cord may occupy the place where the urethra should be. The impediment preventing the discharge of the urine during intra-uterine life may cause an enormous dilatation of the bladder and serious dystocia,² often implicating the death of the child.

Sometimes the urine finds its way out through the urachus, that has remained open, or some other conduit.

Treatment.—Epithelial agglutination is cured by passing a silver probe smeared with vaseline. A transverse membrane may need a perforation with a more sharp-pointed instrument. If there is a more extensive obstruction, it may be overcome by puncture from the vestibule or above the symphysis pubis. If there is an open urachus,

¹ Garrigues, "Obstetrics," p. 247.

² Ibid., p. 401.

this should be ligated after an outlet has been established to the vestibule.

4. ABNORMAL DILATABILITY.—In some women the walls of the urethra are so elastic and the hymen so little elastic that in a vaginal examination the finger may enter the bladder without causing any pain. In such cases the urethra may even offer less resistance to the penis during copulation than does the hymen, with the result that the penis enters the bladder. Under such circumstances the hymen should be excised (p. 165) and the vagina dilated with speculæ or dilators (p. 169) until this becomes the more accessible canal.

§ 2. Injuries.—Injuries to the urethra may come from within or without. A stone or a tumor may be pressed out from the bladder. Sometimes the whole mucous membrane of the bladder has been thrown off. The concomitant overdilatation of the urethra may lead to transient or permanent incontinence.

We have also seen (p. 18) that the methodical dilatation of the urethra by means of dilators and the introduction of a finger may result in permanent paralysis of the sphincters. In other cases the injury is due to a fall or a blow, but the most common source is to be found in obstetric operations, especially the use of that most dangerous instrument, the *crochet*.¹ In this way the whole canal may be slit open. If no substance has been lost, the prognosis for operative repair is favorable. The edges should be split into two flaps, the innermost of which are turned inward towards the urethra and the outermost outward in the direction of the vagina. Each set of flaps is then united with the finest catgut carried in the finest round curved needles. These delicate tissues do not bear much handling. It is, therefore, better not to mop or use antiseptics, but simply to unite the bleeding surfaces as rapidly as possible and tie the sutures loosely. Before beginning any plastic operation on the urethra, an artificial vesicovaginal fistula should be established which gives rest to the field of operation and allows one to dispense with catheterization.

If the tissues forming the urethra have been lost, the injury may, perhaps, be repaired by denuding two longitudinal lateral surfaces as mentioned above in describing hypospadias (p. 379). Or flaps may be cut out in the vestibule, turned with the epithelium inside to the future lumen of the urethra, and united to the remaining tissue and around the opening leading to the bladder. If incontinence reapp-

¹ Garrigues, "Obstetrics," 1902, p. 681.

pears, it may, perhaps, be cured through a secondary operation by which the urethra is elongated or narrowed.

§ 3. **Dilatation of the Urethra and Incontinence.**—After childbirth women often complain that they cannot retain the urine. It may dribble off continually or be involuntarily ejected in a stream in lifting something, coughing, or sneezing. This annoying condition is due to a dilatation of the upper portion of the urethra, the anterior wall being solidly fastened to the subpubic ligament, while the posterior is dragged down by a prolapse of the anterior wall of the vagina. In this way the upper part is, as it were, drawn into the bladder and the lower correspondingly shortened. This portion becomes then too weak to offer the normal resistance to the abdominal pressure exercised from above, and the result is an outflow or ejaculation of the urine.

In other cases the dilatation may extend over the whole length of the canal, inclusive of the meatus, which is seen gaping and shows the reddened mucous membrane.

Treatment.—This enuresis sometimes stops by itself in consequence of the involution of the vagina, but recovery may be expedited by prescribing astringent vaginal injections or the use of cylindrical tampons soaked in glycerin containing boric acid (10 per cent.) and alum (5 per cent.), or the vaginal wall may be lifted with a pessary of hard rubber pressing against the urethra. As a rule, this may be dispensed with after a couple of weeks and supplanted by the astringent tampon and injections. Internally, preparations of ergot are given in order to combat hyperæmia of the uterus.

The incontinence may be due also to defective innervation, when daily massage or faradization sometimes proves useful.

If the dilatation of the urethra and the enuresis persist, recourse must be had to an operation, which should begin by establishing an artificial vesicovaginal fistula, so as to insure rest of the field subjected to knife and needle.

Gersuny's operation consists in dissecting the urethra free, turning it from 270° to 360° around its longitudinal axis, and fastening it with sutures in its new relations.

Pawlick's operation has been described on p. 191.

If the incontinence is due to a cicatrix pulling on the urethra, the cicatrix should be incised and the edges closed in the opposite direction.

If operations do not lead to recovery or the patient refuses to be operated on, she must content herself with a urinal.

§ 4. **Urethrocele.**—Urethrocele is a kind of dilatation, the pos-

terior wall of the urethra bulging out. It is *diffuse* or, more rarely, forms a *diverticulum* with narrow neck. It constitutes a tumor, which may reach the size of a hen's egg. This condition is found mostly in multiparæ. The diffuse variety is probably due to an overstretching and weakening of the muscular coat of the canal during childbirth. A pouch is formed into which the mucous membrane sinks like a hernia. The diverticular kind, on the other hand, may be due to a cyst rupturing into the lumen of the urethra.

Symptoms.—Urethrocele gives rise to frequent and painful micturition. The stagnant urine decomposes and corrodes the mucous membrane. The inflammation may extend to the urethra or even to the bladder. The acrid urine sometimes causes irritation also of the neighboring skin. A stone may be developed in the pouch.

Diagnosis.—The tumor may be so large as to protrude from the vulva. Even when of smaller dimensions, it can be seen and felt. By compressing the meatus, the urethrocele increases in size when the patient bears down. By pressure on the tumor, urine, often purulent in character, is made to flow out from the meatus. A curved sound can be made to enter the tumor through the meatus. The diverticular form may be diagnosed by the difficulty with which the opening is found. A *periurethral abscess* that has ruptured into the urethra gives a different history and is surrounded by indurated tissue.

Treatment.—The diverticular form may be excised and the remaining fistula closed. But if the urethra is much inflamed, it is better to leave it open and treat the inflammation, reserving the closure till the time the mucous membrane has regained a healthy condition. The diffuse variety is treated by making a longitudinal incision in the most dependent portion of the sac and treating the mucous membrane. When this is restored, the superfluous tissue is removed and the fistula closed.

§ 5. *Stricture.*—The normal female urethra being so much shorter and wider than the male, strictures are much rarer in women than in men.

They may be due to childbirth, gonorrhœa, chancroid, syphilitic or tuberculous ulcers. Often they are combined with the presence of a large fistula. The narrowness may be due also to senile atrophy of the genitals. The lumen of the urethra may be diminished by pressure from a periurethral abscess or adjacent tumors, but this does not constitute a real stricture.

The narrowness of a portion of the urethra may lead to dilatation

of that situate behind it. Rarely does it entail partial retention of urine and consequent cystitis. But the patients feel some discomfort in urinating.

The exact condition is easily ascertained by means of bulbous bougies.

As a rule, the disease is easily cured.

Treatment.—Commonly gradual dilatation with Hanks's cervical dilators is all that is required. But if there are hard intra-urethral cicatrices that refuse to yield, they may be cut from the urethral canal and a thick, permanent catheter kept in the bladder during healing. As this incision is painful, the urethra should be made insensible with cocaine. If the constriction, on the other hand, is due to a vaginal cicatrix, this should be severed by multiple parallel incisions, followed by the use of Bozeman's vaginal dilators.

A periurethral abscess ought to be incised from the vagina, in order to prevent its rupture into the urethra.

§ 6. *Prolapse.*—A slight protrusion of the mucous membrane of the urethra is of common occurrence and gives rise to no symptoms, but a prolapse of sufficient dimensions to form a tumor is rare. It is mostly found in children, old women, or weak persons.

Its cause is not always clear, but in most cases it is referable to straining at micturition or defecation, for instance in the presence of a vesical calculus or a fissure at the anus.

Microscopical examination of the removed portion of the mucous membrane has shown that in cases of old standing there is an abnormal production of blood-vessels, so that the tumor constitutes an *angioma*. But in acute cases we have to deal with a true prolapse of the unchanged membrane. The disease may implicate the whole circumference of the urethra or be limited to one wall, usually the lower. In the former case the opening is central, in the latter it is found opposite to the prolapsed part. The tumor may measure as much as 4 centimetres ($1\frac{1}{2}$ inches) in diameter. In the beginning it is covered with normal mucous membrane; but later the color becomes dark, nearly black, the surface uneven, like a mulberry, hard, covered with blood or pus, and sometimes excoriated.

The prolapse causes or increases dysuria or gives rise to complete retention of urine. It may produce also painful coition.

Diagnosis.—Total prolapse is characterized by its central opening. The lateral variety might be mistaken for a caruncle, but differs from it by having always a broad base, and being reducible.

Treatment.—In cases of minor importance a cure may be effected by reducing the prolapse and using a capped sound with tannin or applying tincture of iodine on the mucous membrane, hot affusions of the vulva or hot vaginal injections. But, as a rule, some surgical interference is indicated. The simplest is to introduce a catheter into the bladder and tie a silk thread around the base of the tumor, which falls off in a few days. If there is no retention of urine, the tumor may be transfixed and tied in two halves, leaving the central canal free and cutting off the protruding tissue. If the prolapse begins far back, an incision should be made in the vagina corresponding to the course of the urethra. Through this buttonhole the mucous membrane is seized, pulled out, the redundant tissue cut away, and the fistula closed.

The bladder should always be searched for stone and the anus examined for fissures before proceeding to the operation of the prolapse.

§ 7. **Foreign Bodies.**—Foreign bodies may be lodged in the urethra from within or without. A stone may be expelled from the bladder and be too large to pass through the urethra, especially the comparatively narrow and resistant meatus. Small bodies, such as peas, beans, or glass pearls, may foolishly be inserted by the patient herself. According to its size or shape the body causes complete retention or difficult micturition. The stagnant urine may distend the urethra, the bladder, the ureters, and the pelves of the kidneys. The body may injure the urethra and cause ulceration of the mucous membrane and a periurethral abscess.

The *diagnosis* is easy, since the body is felt by passing a finger into the vagina.

The *treatment* may be quite difficult. The simplest is to steady the foreign body from behind with the finger in the vagina and seize it with a pair of narrow forceps, such as Thompson's urethral forceps, an alligator forceps (Fig. 315), or a stronger instrument. In order to make room for the instrument and the body together it may be necessary first to dilate the canal up to the latter. A spoon-shaped instrument may be passed over it and withdraw it, or it may, perhaps, be snared with a fine wire loop in an *écraseur* (Fig. 316). Sometimes the body can be crushed, giving easy exit to the fragments. If it cannot be removed through the meatus, it should be cut down upon from the vagina and the fistula sutured. If it slips back into the bladder, the rules for removal of foreign bodies in this organ apply to it (see DISEASES OF THE BLADDER).

Chronic simple urethritis causes a discomfort rising to actual pain during micturition. Sometimes injections of moderately strong solutions (5 per cent.) of nitrate of silver with Fritsch's syringe, repeated twice a week, suffice. In other cases treatment through the endoscope is needed. The affected points, recognizable by their dark color and tendency to bleeding, are touched with strong nitrate of silver solutions (20 to 50 per cent.), undiluted tincture of iodine, or the galvanocautery.

By far more common is the *gonorrhœal* variety, which has been described above (p. 141.)

The diagnosis between the non-specific and the gonorrhœal kind is based on the presence of the gonococcus; but if negative, the search should be repeated several times.

§ 9. **Neoplasms.**—The most common neoplasm found in the urethra is the *urethral caruncle*; but as this may be found also outside of the canal, it has been described among the DISEASES OF THE VULVA (p. 134).

All other neoplasms are rarely met with.

A small *cyst* may be formed by occlusion of the opening of an urethral gland. In the course of time it may become pedunculated and form a *polypus*.

Dilated veins may constitute a *varix*. If this ruptures under the mucous membrane, it may give rise to a hæmatoma. The venous tumor may possess erection.

A *fibroma* originating in the vaginal wall may press on the urethra without being intimately connected with it, so that it may be extirpated from the vagina without entering the urethra. But fibromas and *myomas* may develop also from the muscular coat of the urethra itself. They may become pedunculated, hang out through the meatus, and vary in size from a pea to a goose-egg. *Myxoma* has also been observed.

Tertiary *sypilitic tubercles* may invade and destroy the urethra.

The urethra shows a marked resistance to malignant disease in

FIG. 317.



Transverse section through the upper third of the urethra. (Photograph by Viereck.)

the neighborhood. But both sarcoma and carcinoma may primarily originate in the wall of the canal.

Sarcoma is exceedingly rare. It springs from the posterior part of the urethra and grows rapidly. The tension causes pain. The tumor soon ulcerates.

Carcinoma is somewhat more common. It begins at the meatus and extends backward. It is characterized by a granular hardness. It is hardly painful. Sometimes the patient complains of pruritus, which may be due to cancerous affection of the nerves or to acrid secretion irritating the skin. An ulcer develops around the meatus which gradually deepens. A tumor may form, which may become pedunculated. The disease rarely gives rise to hemorrhage, but a thin mucopurulent discharge flows from the canal.

Tuberculous ulcers are rare.

Treatment.—Tumors protruding from the meatus are seized with forceps and drawn out, their base is transfixed and tied in halves. Minor tumors may simply be removed by torsion, but for safety's sake the stump should be cauterized with the thermocautery.

Deep-seated polypi must be exposed with the endoscope and caught with the wire snare, or scraped off with Simon's sharp spoon, followed by galvanocauterization. In order to reach a deep-seated tumor it may be necessary to dilate the urethra or incise it, making an anterior incision $\frac{1}{8}$ inch deep and a posterior $\frac{1}{4}$ inch in depth.

Malignant growths should be extirpated as soon as discovered and the operation should be performed in healthy tissue, even if that involves permanent incontinence.

Tuberculous ulcers should be curetted and dusted with iodoform or xeroform, besides giving attention to the general health (pp. 138, 303).

§ 10. *Neuroses.*—Defective innervation of the urethra may show itself in the shape of impossibility of passing the urine, or of retaining it, or of painful micturition. *Ischuria* is often of purely neurotic origin. No difficulty is experienced in introducing a catheter, which the patient learns to do herself. The infirmity may stop spontaneously or in consequence of mental diversion.

Enuresis is frequent in children and young girls. It may be limited to the time the patient sleeps—*nocturnal enuresis*, or occur also when she is awake—*diurnal enuresis*. Sometimes it is a part of general weakness. In other cases it is due to laziness and lack of attention to the natural indication that the bladder should be emptied. In others there is an irritation of the clitoris, due to adhesion between the glans

and prepuce and the accumulation of smegma. Not infrequently the cause is masturbation.

Treatment.—Bad habits must be broken. The patient must urinate at once when she feels the desire to do so. She should avoid drinking after supper, and always use the chamber before retiring. An adherent prepuce should be separated and the privates kept clean. The author has cured the disease by treating a concomitant cystitis. If the patient is weak and anæmic, iron, strychnia, and hydrotherapy should be prescribed. Ergot and tincture of belladonna have proved useful in the author's hands. Those who are familiar with hypnotism will probably be able to effect a cure with that mysterious agent. Sometimes it helps to touch the urethra with a strong solution of nitrate of silver or with lunar caustic in substance. This causes painful micturition and accustoms the patient to pay attention to the natural indication that the urine should be voided. Or, perhaps, the cause of the effectiveness of the cure is to be found in the dread of having the application repeated. But this is less likely, because castigation is as useless as it is inhumane.

Hyperæsthesia.—In some patients the act of micturition is accompanied by severe pain and spasmodic contraction of the urethra and bladder. This condition may be simply neurotic or due to a fissure at the neck of the bladder. The diagnosis can only be made with the endoscope. If of purely nervous origin, the disease may be cured in a few days by the subcutaneous injection of morphine. Fissure will be considered in connection with the DISEASES OF THE BLADDER.

§ 11. **Inflammation of the Urethral Ducts.**—Near the floor of the urethra, just inside of the meatus urinarius, are found two

fine longitudinal tubes called the urethral ducts (Fig. 318), which may become inflamed. In consequence of the swelling of their mucous membrane, their apertures appear outside of the urethra as yellow spots, surrounded by a red area, from which a drop of pus may be pressed out. The inflammation causes much discomfort, but the pain is not increased by micturition. Pressure, on the other hand, is very painful.

FIG. 318.



The urethral ducts. (Skene.)
The posterior wall of the urethra is split and probes introduced into the ducts.

Treatment.—The tubes should be injected with a 1 per cent. solution of carbolic acid or lysol, or the saturated solution of boric acid, tincture of iodine, or a strong solution of nitrate of silver (1 : 4), or even touched with a probe covered with lunar caustic in substance. If nothing else helps, the tubes may be laid open from the vagina with Paquelin's thermocautery.

CHAPTER X

DISEASES OF THE BLADDER

THE female bladder is shorter than that of the male in the antero-posterior direction, but more than makes up for this by being wider from side to side. It may hold an astonishing amount of urine without causing discomfort. The author has drawn three quarts of urine from a woman who had no retention and was not aware that her bladder was distended. Even four quarts have been withdrawn from this organ, showing its great capacity. But this is exceptional. In irrigating a bladder the physician should always stop as soon as the water produces an uncomfortable feeling of tension, which usually occurs when 4 ounces (120 grammes) have entered the bladder. The inside of the organ is smooth and even, and there is no narrower portion near the urethra, which opens rather abruptly (Fig. 319).

§ 1. **Malformations.**—The bladder is developed from that portion of the allantoid which is enclosed in the body of the fetus. At first it reaches up to the umbilicus, but gradually the upper part shrinks, forming the urachus.



FIG. 319.

Normal trigone. (Photographed by Viertel.)

1. **PERSISTENT FETAL BLADDER.**—Once, in performing hysterectomy, the author found this *fetal shape of bladder* preserved in an adult forty-five years old (Fig. 320). The upper part of the bladder extended as a triangle to the umbilicus, between the aponeurosis of the abdominal muscles and the peritoneum. On either side the hypogastric artery was seen as a hard, solid, white cord.

2. **PERSISTENT URACHUS.**—Naturally the urachus contains a long, narrow cavity, subdivided by partitions and lined with an epithelium, similar to that of the bladder. Abnormally the cavity may communicate with the bladder and open at the umbilicus, constituting a *urachus fistula*. This is mostly due to a closure of the urethra, but

may be found also when this organ is pervious. Perhaps twisting of the urethra may offer sufficient resistance to prevent the normal involution of the urachus.

Treatment.—If the urethra is obliterated, an outlet must first be made for the urine. Next, the opening at the umbilicus is closed, like other fistulæ, by paring the edges and uniting them from side to side.

3. EXTROPHY OF THE BLADDER.—Extrophy (Fig. 321), which means a turning out, is the condition in which the anterior wall of the blad-

FIG. 320.



Fetal bladder in adult. (Author's case.) a, bladder; b b, hypogastric arteries as solid cords; c c, ureters; d, urethra.

der is split in the median line or more or less defective. By intra-abdominal pressure the posterior wall bulges forward as a convex elevation. The cleft is always combined with a corresponding defect in the abdominal wall and often with absence of the urethra and a diastasis between the pubic bones, which may measure several centimetres. Sometimes the split is found only in the upper part of the bladder,

near the umbilicus, so that the sphincters of the bladder and the urethra are preserved, which gives a much better prognosis for operative closure. In other cases there is a hole just above the symphysis, leading into the bladder, or one just below, instead of the urethra. But the common form is that in which immediately above the symphysis is found a dark-red, circular, uneven surface, separated from the skin by an irregular cicatricial line. In the new-born it has the size of a hickory nut, in the adult of an apple. It is very sensitive and bleeds easily. The apertures of the ureters are found on it, and urine is seen

FIG. 321.



Extrophy of the bladder. (Küstner.)

being projected intermittently from them. This malformation is much more common in the male than in the female sex. It is often combined with a split in the urethra and a separation of the clitoris into two halves or a rudimentary condition of that organ. The labia majora and minora are little developed. The perineum, with the anus, is turned forward and upward. The vagina and internal genitals may be defective or well developed, and in the latter case pregnancy and normal childbirth have been observed. The condition is probably due to an arrest of development. The chief symptom is incontinence, but this is absent if the lower part of the bladder, with

the sphincter, is preserved. The rubbing of the mucous membrane against the clothes is painful, and the constant bathing in urine causes excoriation of the neighboring skin. If the pubic bones are separated, the gait is wabbling. Most of these patients die in childhood on account of hydronephrosis and pyelonephritis, which are apt to occur also after operation. But the malformation has been found in a woman seventy years of age.

Treatment.—The exposed mucous membrane must be protected against injury and the urine collected in a urinal. On account of the great friability of the tissues, it is better to wait till the child is from five to seven years old before attempting a cure by operation. The prognosis for this is not very good, either to life or complete recovery; but even if only a protection against injury be obtained and the patient remains incontinent, much is gained for her comfort.

Wood's operation consists in making a large flap above the bladder, leaving a broad pedicle, turning the flap, with the epidermis, against the mucous membrane, pare the edges of this, and suture the flap to it. Next, a flap is cut out from each groin and made to cover the first flap, the two raw surfaces coalescing.

Berg's method consists in making a large flap and covering the denuded surface of it by means of skin-grafting. In a second operation the edges are denuded and united to similar surfaces prepared on the sides of the defective bladder.

Trendelenburg's Method.—He breaks the sacro-iliac joints and holds the split symphysis in contact by an apparatus until it has grown together. By that time the bladder has shrunk so much that its edges may be united with sutures.

Before undertaking any operation, the surgeon should see to it that the urine and the skin are in as normal a condition as possible.

4. DOUBLE BLADDER.—In rare cases the bladder has been found divided by a vertical partition in the middle line into two cavities communicating at the internal opening of the urethra. Or the double bladder may be combined with reduplication of the genitals.

§ 2. *Injuries.*—The most frequent cause of injury to the bladder is childbirth, which may cause rupture, tears, or pressure-necrosis.¹ Next come gynecological operations, especially hysterectomy. Women are less exposed than men, especially soldiers on the battle-field, to gunshot wounds, stabs, or contusions; and on account of the deep

¹ Garrigues, "Obstetrics," 1902, p. 778.

tuation behind the pubic bones, the organ is exposed only when, being distended with urine, it rises out of the pelvic cavity.

Treatment.—If the wound communicates with the abdominal cavity, that in the bladder should be sutured, the abdominal cavity washed out thoroughly with normal salt solution, and then closed too. A wound opening into the vagina should, if possible, be exposed at once and sutured. If it cannot, the fistula sometimes closes by itself, or, at least, shrinks so much that a later operation becomes easier. When feasible, a double-tier suture is preferable, one dealing alone with the mucous membrane of the bladder, the other comprising the remainder of the wound.

§ 3. *Foreign Bodies.*—Many different kinds of bodies find their way into the bladder: stones may enter from the ureters; hair-pins, crochet-needles, and similar objects are introduced by the patient herself through the urethra; ends of catheters or drainage-tubes may break off; a pessary may burrow through the wall of the vagina; and fetal bones may enter from the uterus, tube, or abdominal cavity. Sutures from operations in the neighborhood may gradually reach the interior of the bladder and be expelled with the urine or form the nucleus of a calculus.

Symptoms.—The presence of a foreign body in the bladder causes frequent and painful micturition, sometimes bleeding. If the body remains long, cystitis, with pyuria, is developed. There may be incontinence, either from the urethra or through a vaginal fistula.

Diagnosis.—Sometimes the patient furnishes the history of something having slipped in through the urethra or of a gravidity that did not end in childbirth. In some cases there may be abdominal fistulae through which bones have come out. Or a pessary is found in the vagina which has been worn for years and has gnawed its way into the bladder. The foreign body may nearly always be felt by simply holding a catheter in the bladder and following its movements with a finger in the vagina. A perfect knowledge of the shape, position, and nature of the body is obtained with the galvanic cystoscope.

Treatment.—The foreign body must be removed, which, on account of its shape and position, may be quite difficult. As far as possible this should be done through the urethra. A hair-pin must be turned with the closed end downward, as otherwise its legs will inflict serious wounds or prevent extraction altogether. The beak of the cystoscope may be used for bringing about a position favorable for extraction, which then may be accomplished either through an op-

eration-cystoscope or by replacing the cystoscope by a forceps. The urethra should be dilated, but it is not safe to go beyond 12 millimetres in diameter, as else permanent incontinence may result. Sometimes Kelly's or Skene's speculum may facilitate the removal. If the foreign body cannot be removed through the urethra, an incision may be made in the median line of the vagina or more rarely above the symphysis after distending the bladder. If this organ is in good condition, the wound should be closed immediately. If the bladder is inflamed, it may be more profitable to leave the vaginal wound open so as to have free drainage, or to introduce a permanent catheter through the urethra, while the wound from the suprapubic incision heals.

VESICAL CALCULI, or STONES, are foreign bodies produced in the body of the patient. This affection is much rarer in the female than in the male, gravel even as large as a cherry passing through the short and wide urethra of the former.

A stone may form around a lump of mucus, a suture, or another foreign body.

The *symptoms* are similar to those caused by common foreign bodies. Sometimes the flow of urine is suddenly interrupted, the stone being driven against the internal opening of the urethra.

Diagnosis.—The presence of a stone may be surmised from the symptoms, and is corroborated if gravel has passed with the urine. It may sometimes be felt between a hard catheter and a finger in the vagina, or better with Thompson's stone-searcher; but by far the best way, and that causing the patient least harm or pain, is to look with the galvanic cystoscope, which will reveal many a stone that has escaped all other means of investigation. Before using the cystoscope the bladder should be washed out well with Thiersch's solution and about four ounces of distilled water, normal salt solution, boric acid solution (2 per cent.), or half-strength Thiersch's solution should be injected. If the cystoscope is not available, a vesical speculum will sometimes suffice for a diagnosis; but if the result is negative, the question can be settled only by means of the more perfect instrument. Most stones lie free and sink then to the most dependent part of the bladder, but some may be attached to a fold of the mucous bladder or hidden in a diverticulum.

Treatment.—Minor stones may be withdrawn with a forceps with or without dilatation of the urethra. A larger one should first be crushed and the débris washed out by litholapaxy. It will hardly ever be necessary to have recourse to vaginal or suprapubic cystotomy.

Before operating, the bladder should be placed in as healthy a condition as possible by the internal use of diuretic mineral waters—such as Poland, Waukesha, French Vichy, or Wildungen; salol (gr. x—60 centigrammes—four times a day), urotropin (a tablet of gr. vii ss—50 centigrammes—3 times a day), or cystogen (a tablet of 5 grains—30 centigrammes—3 times a day); and by irrigating the bladder as described above.

§ 4. **Inversion of the Bladder.**—*Inversion*, or *extroversion*, is the condition in which the bladder is partially or totally turned out through the urethra, all three coats participating in the prolapse. The reader should notice the difference from extrophy, which etymologically means the same, but in pathology is used to designate a split bladder.

The occurrence of inversion is very rare and is mostly found in children. It is due to straining at stool or micturition. It may appear suddenly or develop gradually.

It causes pain and tenesmus. It may constitute a tumor as large as an orange. Through the dribbling urine in the chronic variety the skin of neighboring parts becomes eroded. The ureters and kidneys may become inflamed and the patient succumb to uræmia. The protruded part may become strangulated and gangrenous. As a rule, the tumor can be reduced without much difficulty.

Diagnosis.—A *urethral polypus* cannot be pushed into the bladder. A *vesical polypus* can be replaced, but can then be felt in the bladder, while, after successful reduction of the prolapsed bladder, the tumor disappears. In *prolapsed urethra* the urethral canal is found in the middle of the prolapse, whereas in prolapse of the bladder the urethra encircles the neck of the tumor. In the former the prolapse is continuous with the meatus, while in the latter this forms a ring surrounding the tumor. In complete prolapse the openings of the ureters, with their intermittent jets of urine, become visible.

Treatment.—The protruding bladder should be cleansed by affusion of hot Thiersch's solution or normal salt solution and the viscus re-inverted, beginning at the base of the tumor, like a hernia. In partial prolapse the restitution may be furthered by large vesical injections. To use a thick sound for reinverting the bladder is not without danger of perforating the organ. When replacement has been accomplished, the patient should be kept in bed for several days. A pad should be applied over the vulva and kept in place by a T bandage. Easy movement of the bowels should be insured by the

administration of a laxative ; but besides, the bladder should be quieted by rectal suppositories with opium, belladonna, or hyoscyamus.

Most frequently the prolapse and reduction is followed by incontinence, which should be treated as in other dilatations.

§ 5. *Cystitis*.—When the bladder is distended, it leans forward and to the right side, the peritoneum being lifted from it as seen in Fig. 322, so that the bladder may be incised over the symphysis without opening the peritoneal cavity. As much as a hand-breadth of the viscus may thus be stripped.

The collapsed bladder is found in one or two shapes : either the

FIG. 322.

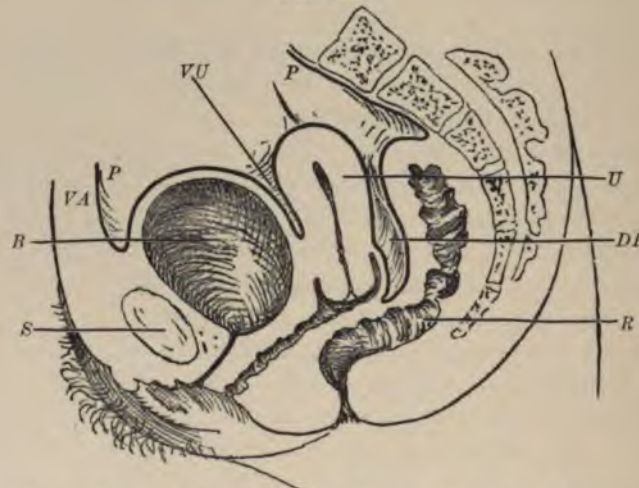


Diagram showing the peritoneal covering of the distended bladder. (A. L. Ranney.) *PP*, peritoneum ; *R*, rectum ; *U*, uterus ; *B*, bladder ; *S*, symphysis pubis. The vesico-abdominal (*VA*), vesico-uterine (*VU*), and the recto-uterine, or Douglas's pouch (*DP*) are made very apparent.

vertex sinks down against the base, so that the lumen together with that of the urethra forms a Y (Fig. 323), or the anterior and the posterior walls are applied against each other (Fig. 194, p. 231), so as to form with the urethra a curve, the concavity of which is turned forward.

The inflammation of the bladder—cystitis—is a common disease. It is either *acute* or *chronic*, *superficial* or *deep*, *local* or *general*. In the *acute superficial* variety, which is by far the most common, the mucous membrane becomes swollen and red, epithelial cells are thrown off in small flakes, and new-formed, small round cells are expelled into

the urine. In severer cases the whole wall of the bladder becomes thickened, ulcerations develop in the mucous membrane, and may implicate the muscular wall and even perforate the peritoneal covering. The mucous membrane may become necrotic and may be expelled in shreds or *in toto*, and portions of muscular tissue may likewise become detached. The ureters and the pelves of the kidneys may become distended by lack of outflow.

FIG. 323.



Sagittal section of pelvis. *a*, symphysis pubis; *b*, bladder; *c*, small intestine; *d*, large intestine; *e*, anus; *f*, perineal body; *g*, vulva; *h*, vagina; *i*, uterus.

In the *chronic* inflammation the wall is always thickened, the organ is contracted, the mucous membrane is slate-colored, and shows sometimes ecchymotic patches or infiltration with pigment, a remnant from previous extravasations of blood. Often it is the seat of ulcers and is covered with tenacious mucus and thick pus. It may also show incrustation with phosphate of ammonium-magnesium. The swelling of the mucous membrane at the orifices of the ureters may lead to partial occlusion and consequent hydronephrosis. The inflammation may extend upward, causing ureteritis and pyelonephritis. If the cystitis is caused by over-distention, the walls are thin, and the inflammation is apt to have a diphtheritic character: the mucous mem-

brane may show diphtheritic infiltration, which in neglected cases may end in perforation.

The *local* inflammation is most frequent near the internal os of the urethra, the so-called neck of the bladder.

Etiology.—Cystitis may be due to exposure, especially by getting cold feet. It may be produced by the use of cantharides, or the too free consumption of asparagus. It is apt to supervene in extensive burns. Sometimes it is induced by masturbation. Most frequently it is occasioned by infection, and this, again, as a rule, is the result of catheterization. The catheter used may not be aseptic or the genitals may not be properly cleaned before introducing it. But even an aseptic catheter by passing through the urethra may carry pyogenic microbes into the bladder. In 24 per cent. of healthy women the urethra has been found to contain microbes, which may have wandered in from the vagina or the anus. The nurse or the patient herself in wiping the anus after defecation forward and upward may deposit the microbes right on the meatus. From the urethra microbes may continue their migration into the bladder. The urine may contain bacterium coli commune, bacillus tuberculosis, staphylococcus ureæ non pyogenes, staphylococcus pyogenes albus, streptococcus, gonococcus, another diplococcus much like the gonococcus, yeast cells, and the fungi of mould. The spontaneous invasion of the bladder occurs with greater frequency in old age, when the genitals have lost their resiliency and the mucous membrane of the urethra is often everted.

If the catheter not only carries microbes into the bladder, but at the same time this organ is injured, the situation becomes much more serious. Similar injury may be caused by a stone, a foreign body, or surgical instruments, such as the cystoscope, the stone-searcher, and especially the lithotrite.

Cystitis arises with great frequency in childbed, when the bladder has been squeezed between the head of the fetus and the pubic bones and is in a congested condition, and the patient often is unable to urinate, and the lochia abound in microbes.¹

A very dangerous form of cystitis is brought about by the impaction of the retroflexed gravid uterus.² If such a case is neglected, a diphtheritic process develops in the submucous tissue, and the whole mucous membrane may become necrotic and be exfoliated.

The inflammation of the bladder may be secondary to urethritis,

¹ Garrigues, "Obstetrics," 1902, p. 777.

² Garrigues, *ibid.*, p. 298.

especially gonorrhœa, but this is less common in women than in men, the short and wide urethra allowing the urine to burst forth with great force, effectually irrigating the canal.

The cystitis may also be caused by an abscess in the neighborhood rupturing into the bladder, or even by the mere contiguity without direct communication. Or it may originate in inflammation of the ureters or kidneys. Even an inflammation in remote parts, such as an angina or a pneumonia, may become complicated with cystitis. Also a tumor in the bladder may incite inflammation in this organ.

Symptoms.—Frequent micturition, pain in the hypogastric region, and admixture of pus to the urine are the chief symptoms. The desire to urinate may in severe cases return every few minutes or become almost permanent. The pain is also continuous, but is particularly pronounced after urination. Often it has the character of tenesmus, a painful cramp-like contraction, and a similar sensation may be experienced in the rectum. With the pain over and behind the symphysis may be allied that in the sacral region. The bladder is sensitive on palpation from the vagina or through the abdominal wall.

The condition of the urine varies much according to the variety and severity of the affection. In the lightest cases it is only a little turbid and shows on standing a white cloud suspended in the fluid. In more severe ones a purulent collection settles at the bottom, and in the chronic inflammation this usually is covered by a sticky mucus. Rarely the urine contains blood, except in that form of cystitis due to impaction of the retroflexed gravid uterus.

The reaction is in acute cases in the beginning slightly acid or neutral, the amount normal or a little increased, the specific gravity ranges from 1005 to 1020, or, if the patient has fever, even 1030. After evacuation it soon turns alkaline. The precipitate contains pus cells, bladder epithelium cells, triple phosphate, and, as a rule, microbes. The pus mixed with the urine gives rise to the reaction of albumin, while the filtered fluid does not contain any. Sometimes, especially if there is retention, the urine becomes strongly alkaline and offensive. In chronic cystitis it is neutral or alkaline.

The urine is often passed interruptedly, even in drops. In impaction of the gravid uterus there may be complete retention, with severe pain. The bladder forms a tumor over the symphysis and the retroflexed uterus is felt in the vagina. The percussion sound in the hypogastric region is dull. The retention is due to a twisting of the urethra and pressure exercised on it by the neck of the womb.

Sometimes the patient is misled herself, there being from time to time a discharge of urine, although the bladder remains overdistended—so-called *ischuria paradoxa*. If this retention is allowed to go on, the pressure becomes so great that the mucous membrane, deprived of its blood supply, becomes anæmic and necrotic, which latter condition is favored also by contact with the decomposed, ammoniacal urine. The situation is made still more grave, if unskilful and rough attempts at using the catheter lead to the formation of false passages. In this form of cystitis there may be considerable fever, the thermometer rising to 103° F., while in the common catarrhal variety there is little or no febrile movement. The patient may have one or more chills. An adynamic condition develops, characterized by a dry tongue, headache, vomiting, subsultus, and delirium. The internal opening of the urethra may be blocked up by shreds.

An abscess may rupture into the bladder without evoking any other symptom than the purulent urine; but acute cellulitis of the broad ligament is accompanied by considerable pain, fever, perhaps strangury or ischuria, and the upper part of the urethra may be difficult and painful to pass, all of which symptoms give suddenly way to euphoria the moment the pus finds an outlet into the bladder.

Diagnosis.—Pus in the urine may come from the urethra, the bladder, the ureters, the kidney, or an abscess communicating with the bladder. By directing the patient to void the first ounce of urine into a separate vessel, this will be purulent, if the pus originates in the urethra; and the remainder will be clear. If the bladder is washed out and the first few drachms again are purulent, the pus comes probably from the ureters or kidneys. The pus secreted by the short urethra can only be small in amount. The seat of the pain gives valuable information: in cystitis it is situated in the hypogastric region, in pyelonephritis in the lumbar. In the former pressure over the symphysis or from the vagina excites pain, in the latter the lumbar region is sensitive. The epithelial cells found in the urine may be so characteristic in shape that their origin is indubitable. Casts always emanate from the kidneys.

Pain only during micturition is due to urethritis. In cystitis it is constant. Pain following the act may be due to inflammation of the peritoneal covering of the bladder. Dysuria is not in itself proof of cystitis. It may as well be caused by inflammation in the neighborhood of the bladder, which can be ascertained only by bimanual examination.

The urine is mostly alkaline, while in tuberculosis it is acid. It has sometimes an offensive putrid odor. A fecal odor combined with pneumaturia shows generally that the bladder communicates with the intestine. But gas in the urine has also been found in impaction of the retroflexed gravid uterus, due to the presence of bacterium coli commune or bacterium lactis aerogenes.

If there is blood in the urine, it sinks to the bottom of the vessel; and examined under the microscope the red blood-corpuscles are entire, while in hæmoglobinuria, a condition caused by poisoning with chlorate of potassium, or by congelation, they are dissolved.

Feces in the urine may be recognized by microscopical examination, which reveals the structure of vegetables or fibres of muscular tissue.

By means of the cystoscope the inside of the bladder is made visible. One may see the color, irregularities in the surface, ulcers, the condition of the ureteral openings, etc.

Prognosis.—By far the greater number of cases of cystitis get well by proper treatment in a few days or two weeks. Even in cases of deep cystitis with loss of mucous membrane and some muscular tissue the prognosis is not bad. Nature substitutes new tissue for the old one, and the patient may make a perfect recovery. But if no help is administered, the bladder may rupture and the patient die of peritonitis; or the inflammation may ascend to the kidneys and result in the formation of abscesses in those glands and a fatal issue by uræmia.

Ascending inflammation is particularly to be feared when the urine becomes offensive. Pyelitis and nephritis are ushered in by high fever, pain in the lumbar region, and often rigors.

The chronic variety may be very protracted, extending over many months. Sometimes there ensues apparent recovery, but relapses supervene from time to time.

Treatment.—Prophylaxis commands proper protection against exposure; avoidance of the consumption of too large amounts of substances which may lead to inflammation of the bladder; the greatest care in the use of catheters (p. 38), especially in childbed; and the evacuation at proper intervals of the bladder, particularly in pregnant women.

To draw the urine under cover, which formerly was done to satisfy the modesty of the patient, must be looked upon as obsolete and inadmissible at our present stage of knowledge in regard to the rôle microbes play in the production of cystitis.

The curative treatment varies necessarily with the kind and degree of cystitis present. Light cases may be treated in the office or dispensary; but if the inflammation is at all severe, especially if it is accompanied by fever, the patient should stay in bed. She should be put on a bland diet, avoid spices and alcoholic beverages. She should drink much milk or buttermilk, plain water, and mild mineral waters,—such as Poland water, Waukesha water, Buffalo lithia water, Wildungen water, and, best of all, imported Vichy water (célestins),—almond milk, or linseed tea. A saline aperient helps to combat the hyperæmia. As far as possible, catheterization should be eschewed. If the urine is acid, alkalies, *e.g.*, liquor potassæ with belladonna (p. 125), are indicated. The so-called A. B. C. mixture—

R Potassii acetatis,
Potassii bitartratis,
Potassii citratis, āā ʒ i (4 grammes),
Tritici decocti (ʒ ss to ʒ viii—15 grammes to 240 grammes).—M.
Sig.—Shake well. A tablespoonful from 4 to 6 times a day.

is both diuretic and laxative.

If the urine is alkaline, the saturated solution of boric acid (4 per cent.) may be prescribed in doses of a tablespoonful from four to six times a day, or benzoate of ammonium or sodium may be administered in 10-grain doses (60 centigrammes) every two hours. In order to disinfect the bladder through the mouth, urotropin (a tablet of gr. vii ss—50 centigrammes—dissolved in a tumblerful of water is given two or three times a day), or cystogen (a tablet of gr. v—30 centigrammes—t. i. d.), identical preparations which owe their great efficacy to the formalin which they contain. Salol (gr. v to xv—30 centigrammes to one gramme—t. i. d.) and salicylate of sodium (gr. xv—1 gramme t. i. d.) are used for the same purpose. To combat pain narcotics are indicated, such as tincture of belladonna (℥ v to xv—30 centigrammes to 1 gramme—t. i. d.), tincture of hyoseyamus (℥ xv to xxx—1 to 2 grammes—t. i. d.), tincture of stramonium (℥ v to xv—30 centigrammes to 1 gramme—t. i. d.), or opiates, especially suppositories with pulvis opii (gr. i—6 centigrammes), to which may be added extractum belladonnæ (gr. ¼—15 milligrammes). One such suppository may be administered every three hours, and is very effective against tenesmus. Or twenty drops of laudanum in two ounces of starch, boiled as for laundering, may be substituted. Chloral hydrate (gr. xx—130 centigrammes) may be used in a similar way. A

warm flaxseed-meal poultice placed over the symphysis and renewed every two hours is grateful and cannot quite as effectually be replaced by a rubber hot-water bag.

If treatment by the intestinal canal does not suffice, recourse must be had to irrigation of the bladder. The best fluids for this purpose are sterile water, normal salt solution, boric acid, and silver nitrate (p. 61).

In *impaction of the retroflexed gravid uterus* the first indication is to relieve the bladder by catheterization; but if it has been much distended, there is danger of hemorrhage by oozing from the mucous membrane, which even may be fatal. The bladder should under such circumstances not be emptied at once, but with intervals. If the urine is of bad quality,—purulent, ammoniacal, bloody, or offensive,—it is even best after having let out some of it with a catheter to inject a smaller portion of some antiseptic solution, especially saturated solution of boric acid and leave it there.

When the bladder has been emptied the uterus should be replaced.

If the bladder is much affected, it is best first to wash it out with plain water until this returns clear, and then use boric acid or silver nitrate. The two first-named may be used three or four times a day, the third twice a week. If there is serious hemorrhage, injection of ice-water or hot water (105° to 110° F.) should be made into the bladder, although it is very painful. Tenesmus is sometimes relieved by such injections into the rectum.

Hot sitz baths (110° F.) or a warm bath also quiet pain. The bromides of potassium and sodium (gr. xv—1 gramme—every 4 hours) serve to tranquillize the nervous system.

An abscess may rupture into the bladder without setting up cystitis. In such cases it is better to abstain from local treatment. The cavity closes by itself. If the bladder becomes inflamed, the condition is treated as any other cystitis.

A great part of the wall may form a pouch in which pus and urine stagnate. If the condition can be recognized, a solid catheter should be forced through the partition, when a highly offensive fluid will be evacuated, and after its escape the bladder should be irrigated with water and boric acid. If catheterization is unusually painful, the urethra may be anæsthetized by injecting a solution of cocaine hydrochlorate (4 or 5 per cent.) into it and leaving a little stick (a match or a toothpick), wound with absorbing cotton dipped in the solution, in the urethra for five minutes.

If the bladder is very irritable, Skene's self-retaining catheter (Fig. 324) may be left in it. A piece of rubber tubing is slipped over the outer end and inserted into a male urinal (Fig. 325) which

FIG. 324.



Skene's self-retaining catheter.

FIG. 325.



Glass urinal.

lies between the patient's thighs. Irrigation may be made through it. If the catheter cannot be borne, an artificial fistula should be made.

In *chronic cystitis* pure benzoic acid (gr. x—60 centigrammes) may be prescribed to be taken in a capsule from 3 to 8 times a day. Likewise oleum santali or eucalyptol in similar amount.

The bladder may be washed out with peroxide of hydrogen diluted with 3 or 4 times as much water. Ichthyol ($\frac{1}{2}$ to 1 per cent.) is especially recommended in cystitis of gonorrhœal origin. Resorcin (2 per cent.) is also used for cleansing the bladder.

R Iodoformi, 50 parts ;
Glycerini, 40 parts ;
Mucilaginis gummi arabici, 10 parts.—M.

Of this mixture an ounce (30 grammes) is injected 2 or 3 times daily. Half an ounce (15 grammes) of a 5 per cent. solution of cocaine left in the organ for 5 minutes anæsthetizes it.

When everything else proves futile, a powerful remedy yet holds out hope of relief and recovery. By establishing an artificial vesico-vaginal fistula the urethra and that portion of the bladder which lies nearest to it are accorded a welcome rest. It is not difficult to make such an opening. The anæsthetized patient is placed in Sims's position, the perinæum is drawn back with a Sims speculum, a male metal sound is introduced through the urethra and made to protrude in the median line, about $\frac{1}{2}$ inch beyond the internal opening of that passage, and an incision is made by cutting down on the sound, with a scalpel, through the whole thickness of the partition between the vagina and the bladder. If the object is to create a way for the palpating finger, and still more so if a large body shall be removed through the aperture, this may be enlarged by cutting with scissors in

the direction of the vaginal portion of the uterus, as much as $1\frac{1}{2}$ inches more. The fistula shrinks considerably, and a smaller opening may even close spontaneously. It is therefore best to hem it by uniting the mucous membrane of the bladder and that of the vagina by means of a running catgut suture. If the fistula does not close spontaneously, it is done by paring the edges and uniting them with interrupted sutures.

In order to avoid bleeding, the opening may be made with Paquelin's thermocautery or the galvanocautery and a special forceps invented for the purpose by the late Dr. John Byrne, of Brooklyn, N. Y. (Fig. 326). It consists of a fenestrated blade, which lies in the vagina, and a grooved blade, which is inserted into the bladder. When in place, the blades are locked. The cautery being applied through the

FIG. 326.



Byrne's cystotomy forceps.

fenestra and following the groove makes a very accurate linear incision.

If a fistulous tract remains between an abscess, the bladder, and the intestine, a counter-opening should be made in the most convenient place above Poupart's ligament or in the vagina. When good drainage is procured, the fistula closes of itself.

§ 6. **Urethrovesical Fissure.**—A fissure is a linear ulcer, situated in the posterior portion of the urethra and extending a little into the bladder. It develops in the mucous membrane and is grasped by the vesical sphincter. It is $\frac{1}{4}$ to $\frac{1}{2}$ inch in length, and $\frac{1}{12}$ to $\frac{1}{6}$ inch in width. The bottom is gray, the edges red. It may be caused by injury during labor or by inflammation of the urethra, and is not very rare, but doubtless often overlooked.

It is characterized by frequent micturition and a constant pain in the region of the inner opening of the urethra, which is worst shortly after micturition. It is also increased by acidity of the urine. Sometimes a few drops of blood may be expelled at the end of urination.

Pressure in the vagina on the place corresponding to the ulcer calls forth a cutting pain.

Diagnosis.—In *cystitis* the pain is spread over a larger area and is often relieved by micturition. The urine is clear with fissure, purulent in *cystitis*. The ulcer can be seen with the endoscope.

Prognosis.—The disease is not self-limiting and is hard to cure.

Treatment.—Dilatation of the urethra gives some relief; but unfortunately it cannot be carried to the same extreme as in fissure of the anus, on account of the danger of producing permanent incontinence. Pencils or fluids containing narcotics and astringents are apt to make the condition worse. The ulcer must be destroyed with lunar caustic or the galvanocautery, or deeply incised with a knife. These procedures can be performed only through the endoscope with lateral opening, and are quite difficult. If the fissure is situated on the posterior surface of the urethra, the vagina is pressed with the index into the opening of the endoscope, which both makes it more accessible and keeps back the urine. The mucous membrane is then dried with bibulous paper, where it presents in the opening of the endoscope, before applying the cautery or the knife. The same may be done fairly well when the fissure is situated laterally; but if it is found on the anterior wall, there is hardly any possibility of carrying out the plan.

§ 7. *Neurosis.*—Under the name of *irritable bladder* a condition has been described in which there is frequent micturition and pain in the region of the bladder, but no pathological change of the viscus or of the urine except that this may be unusually saturated or diluted. In most cases it is only a symptom of disease in a neighboring organ, either the urethra, or the genital or the intestinal tract, such as inflammation of the uterus or its appendages, an anal fissure, hemorrhoids, etc. A retroflexed uterus may drag on the base of the bladder. The gravid uterus by its pressure induces frequent micturition. Likewise, uterine or ovarian tumors. In other cases the irritability forms part of a general neurotic disposition. It is not rare in nervous and hysterical women, in whom it may cause incontinence or retention, as we have seen above in treating of the urethra. Some individuals cannot urinate in the presence of others, while, on the other hand, the sound of running water is so suggestive to them that they with difficulty can retain the urine. Also during coughing or under the influence of anxiety or fright the urine may pass involuntarily. Often the irritability is due to masturbation. The bladder becomes irri-

tated when in contact either with too concentrated or too diluted urine.

As to *diagnosis*, the possible presence of a *urethrovesical fissure* should be borne in mind.

Treatment.—First of all, the cause should be searched for. Any disease in neighboring organs should receive proper attention. Bad habits must be given up. The nervous system, if broken down, should be toned up with iron, arsenic, strychnin, extract of red bone-marrow, phosphorus, exercise in the open air, sea baths, country air, and nutritious, but simple, food. Bromides, belladonna, hyoscyamus, datura, and chloral serve to quiet the irritability and subdue pain. Opiates are hardly required. The galvanic current, with the negative pole in the vagina and the positive above the symphysis, has also proved valuable. Hot vaginal injections, hot sitz baths, and application of cloths wrung out of hot water, a warm poultice, or a hot-water bag applied to the hypogastrium have a soothing effect.

§ 8. *Neoplasms*.—All neoplasms are much rarer occurrences in the female than in the male bladder.

A. *VILLOUS POLYPUS*, or *papillary fibroma*, is the form most frequently met with. It consists of a connective-tissue stroma and epithelium, and is, like all bladder tumors, rich in blood-vessels. Usually it has a compact centre and breaks up in numerous long, thin villi (Fig. 327). More rarely it looks like a stem with round outgrowths like grapes or raspberries. It is often pedicillate, and frequently very soft in consistency, but may also be hard. Generally it sits at the side of or on the trigone, but sometimes there are small additional tumors on the higher portions of the wall. It grows very slowly and has not the microscopical structure of cancer, but, on the other hand, it is apt to recur after extirpation and may degenerate into carcinoma. It may grow to such a size as to fill the bladder. The chief symptom is hematuria.

B. *CARCINOMA*.—Carcinoma begins as hard, thick masses under the epithelium, which become covered with villi, so that only microscopical examination can distinguish it from papillary fibroma. The tumor may break down and form an ulcer. Rarely the whole wall of the bladder is infiltrated with carcinomatous tissue. It causes hemorrhage, and if the tumor undergoes mortification, the urine becomes offensive. This kind of tumors gives rise to more pain and is often accompanied by fever. When it spreads into the connective tissue on the sides of the bladder, it hinders contraction of that organ. When

it implicates the peritoneal coat, it produces peritonitis. Tumors may be felt over the symphysis. The neoplasm generally produces cystitis, and the inflammation, ascending through the ureters, may result in abscesses in the kidneys, until the patient, worn out by pain and loss of blood, finally succumbs.

C. MYOMA is rare. It originates in the muscular coat of the bladder, and may, like a uterine myoma, develop outward, or inward and

FIG. 327.



Papillary fibroma of the bladder. (Fritsch.) Above is the surface left by the galvanocaustic wire; the narrow middle portion is the place compressed by forceps.

become pedunculate. If the pedicle becomes too thin, nutrition is insufficient, and the tumor may be disintegrated and bleed, but hemorrhage may be due also to mere hyperæmia and stasis of blood.

D. SARCOMA, composed of spindle or round cells, and provoking metastases in the lungs and glands, has been found on the vertex. Other tumors, such as *myxoma*, *myxosarcoma*, *fibrosarcoma*, *angioma*, *adenoma*, and *dermoid*, are exceedingly rare. If a dermoid ruptures, the urine may contain hair (*pilimiction*), but the same is the case if a dermoid situate in a neighboring part becomes adherent to the bladder and ruptures into it.

Symptoms.—All bladder tumors cause hemorrhage, which becomes almost continuous and produces anæmia. Blood-clots, a pedicellate tumor, or a villus may close the internal opening of the urethra and thus suddenly interrupt the jet of urine in micturition, like a stone. Frequent micturition and tenesmus are common, but may be absent. The tumor, especially a malignant one, usually causes pain. Sometimes it elicits cystitis, with

purulent urine. Fragments may be expelled.

Diagnosis.—In a lean patient even a tumor not larger than an ovary may be felt by bimanual examination. The urine may contain particles of the tumor or columnar epithelial cells, which are pathognomonic for villi, while the normal bladder has tessellated epithelium. A villus may be caught in the eye of a catheter and torn off. By

means of the galvanic cystoscope the whole inside of the bladder can be made visible. After dilatation of the urethra the little finger can be introduced into the bladder, and by appropriate simultaneous manipulations in the vagina and above the symphysis the tumor can be felt, wherever situated. It is not safe to use a thicker finger for the exploration, since it may be followed by incurable incontinence. If necessary, an explorative incision may be made in the median line of the vagina, making room for the index and middle fingers. Only by microscopical examination of a fragment of the tumor can it be decided whether it is malignant or benign.

Hematuria may come from the urethra, the bladder, the ureter, or the kidney. If it originates in the urethra, the amount of blood is small. It may be due to gonorrhœa, common urethritis, tuberculosis, tumors, or foreign bodies. By directing the patient to void the first urine into a separate glass, it will be found that this contains blood, whereas the following is unmixed.

Vesical hemorrhage may be the result of diapedesis, the blood being seen to ooze in drops from the intact mucous membrane. In other cases it may derive from an ulcer, a rupture of the tissue due to damming up of the blood, or a foreign body injuring the inside of the bladder. Cystitis rarely causes hemorrhage, tuberculosis frequently. It may arise also from syphilis. With tumors it is nearly always present.

If the blood flows from the ureter, it can be seen with the cystoscope entering the bladder after this has been washed out.

Prognosis.—The only good feature of vesical tumors is their slow growth. They weaken the patient by loss of blood, may cause inflammation ending in renal abscess, and they have a tendency to become malignant, if they are not so from the start, and to recur after extirpation.

Treatment.—There is only one course to be followed,—namely, the removal of the tumor; but before deciding on it, the surgeon must weigh in his mind whether the patient is strong enough to undergo the operation, which often entails considerable loss of blood and demands a painful after-treatment.

The best method is the suprapubic incision in the elevated-pelvis position, which offers greater facilities for seeing and a better chance for arresting hemorrhage. The patient is prepared in the usual way and is given 10 grains—60 centigrammes—of salol, 3 times a day for several days preceding the operation. The bladder is washed out

with a copious amount of boric acid solution (several quarts of a 2 per cent. solution). A transverse incision, $2\frac{1}{2}$ to 3 inches long, is made just above the pubic bones, one-half on each side of the median line. An assistant lifts the bladder into the wound by means of a thick male sound. The operator seizes the bladder with mouse-toothed forceps and cuts down on the sound. Next, he enlarges the wound to both sides with scissors, so as to make room for two fingers and obtain a free view of the interior of the bladder. The mucous and fibrous coats of the viscus are kept together with artery-forceps, which at the same time serve to arrest hemorrhage, or if the instruments are in the way, bleeding vessels may be tied with catgut and the mucous membrane united with the outer surface by several sutures left long and serving as guy-ropes. Next, the operator seizes the tumor between the index and middle fingers and lifts it into the wound, which may result in the base giving way and the whole tumor coming off. Otherwise it is cut off with a small Paquelin or galvano-caustic knife or snare. If the pedicle cannot be brought into view or surrounded by a wire, it may be cut with curved scissors. Broad-based tumors are removed with curved scissors and the sharp curette or Thomas's spoon-saw. If the tumor is situated far away from the trigone, there is no danger of injuring the ureters, and therefore the base may be transfixed and the ligatures crossed and tied on the outside of the bladder.

The arrest of hemorrhage may be difficult, ligatures cutting through the soft tissue. The simplest, but not always sufficient, means is to irrigate with ice-water or hot water (110° F.). Temporary compression of the tissue between fingers in the bladder and in the vagina may be successful. If these procedures do not accomplish what is needed, application of liquor ferri chloridi or the touch with the thermocautery or galvanocautery hardly will. A solid tampon in the vagina combined with outer pressure with compresses or bandages or sand-bags above the symphysis may stop the bleeding; but in the worst cases, to this must be added tamponing of the bladder itself. A self-retaining catheter is left in the bladder and remains after the removal of the tampon 24–36 hours after the operation. Rarely it is necessary to renew the tampon. The following days the bladder is irrigated with Burow's solution, a mild astringent and antiseptic, containing acetate of aluminum. The urine is kept bland by the administration of alkaline waters.

The use of vesical tamponade precludes closing the wound. If no

tampon is needed, the wound in the bladder may be closed by tier-sutures, one uniting the mucous membrane and the other the remainder of the wall; but even then the wound in the abdominal wall should be left open and loosely packed with iodoform gauze. While fresh urine running over a wound in no way interferes with healing, stagnating and decomposed urine under the skin gives rise to wide-spread and most dangerous mortification of the connective tissue. The catheter left in the bladder may be deranged or withdrawn by the unruly patient. To prevent harm, the wound should, therefore, be left open so that there is free drainage; but if it is large, it may be diminished by suture at both ends. If the bladder also is left open, its edges should be united to the skin. The wound thus left heals by granulation. If healing is too sluggish, the granulations may be excited to greater life by painting them with a solution of nitrate of silver (2 to 5 per cent.) or undiluted tincture of iodine, or by covering them with acetanilid, or dressing with camphor emulsion (10 per cent.). If even then the process of repair is too slow, the granulations are scraped off with a curette and the edges united by interrupted sutures. The cicatrix is drawn in and covered by the pubic hair. In order to avoid the weakening effect of a protracted sojourn in bed, it is better to let the patient get up as soon as possible, even if the wound is not healed.

If the tumor is malignant, compliance with general surgical rules demands the complete removal of its base, so as to operate in healthy tissue. For this purpose a resection of a portion of the bladder or even its complete extirpation may be necessary. If the openings of the ureters are comprised in the part that is removed, they must be implanted either in another portion of the bladder or, in total extirpation, in the vagina. But even if this operation as such is successful, generally after some time the kidneys are infected, and the patient succumbs.

Instead of entering the bladder through the abdominal wall, the tumor may be reached through an incision made in the median line of the vagina and turned out into the latter, but the hæmostasis may prove more difficult than by the abdominal method.

To dilate the urethra and remove the tumor through that canal can only be done with small or very soft tumors and may lead to incurable incontinence.

E. TUBERCULOSIS.—The bladder is seldom the seat of tuberculosis. Primary tuberculosis is particularly rare. Ordinarily the disease descends from the ureter and kidney. If the kidney is affected, the

ureter always becomes so, but fortunately one kidney and the corresponding ureter may remain healthy. The places of predilection in the bladder are around the internal opening of the urethra and the apertures of the ureters. Sometimes the peritoneal covering of the organ is first attacked.

Tuberculosis is due to infection with bacillus tuberculosis. It is most common in young women and occurs almost exclusively in weak, anæmic, and scrofulous individuals. It appears in the shape of gray miliary tumors, which may be transformed to cheesy masses or break down, forming small leeticular ulcers, having a red area and surrounded by miliary growths. By the confluence of several such small round ulcers, larger irregular ones are developed. The tumors may become so large as to fill the pelvis. Generally the bladder contracts and becomes quite small.

The *symptoms* are those of cystitis, with this exception, that hæmaturia, which is rare in common cystitis, often occurs in the tuberculous variety. It is even apt to appear as an early symptom, like hæmoptysis in pulmonary tuberculosis. Secondly, the urine is always acid, while in common cystitis it is often alkaline. Thirdly, the pain is usually more severe.

Diagnosis.—Tuberculosis may appear like a common acute cystitis. The presumptive diagnosis is based on the absence of other causes of cystitis, on the acid urine, the hæmaturia, the great pain, and the presence of tuberculosis in other organs. The cystoscope reveals ulcers and tumors and often an inflamed condition of one or both ureteral apertures. But for an absolutely sure diagnosis it is necessary to demonstrate the presence of the tubercle bacilli, which sink to the bottom in a coniform glass or may be rapidly precipitated by means of a centrifugal machine and then prepared for inspection on dry slides.

It is of the greatest possible importance for the treatment in case one ureter furnishes tuberculous urine to ascertain whether the other kidney is healthy. This may be done by Rose's method (p. 40), or by inserting through the cystoscope a catheter into the apparently healthy ureter. By leaving another catheter in the bladder and comparing the urine which comes from the bladder with that from the ureter, it will be found that the former is purulent and contains tubercle bacilli, while the latter is normal. The normal kidney does not allow the bacilli to pass. If, therefore, they are found in the ureter, the corresponding kidney must be affected. In catheterizing the

healthy ureter the greatest possible care should be taken not to carry tubercle bacilli into it from the bladder. This danger is avoided by collecting the urine without the use of a catheter.

The *prognosis* is grave. Women affected with tuberculosis of the bladder seldom live over two years, although in rare cases life has been sustained eight or ten years.

Treatment.—The general treatment is like that for tuberculosis in other organs (pp. 138, 403). Narcotics are needed to combat the severe pain; but as the disease is one of long duration, opiates should be avoided as much as possible in order not to create the deleterious drug habit. After emptying the bladder, it may be injected with cocaine (see page 26) or with heroin (gr. $\frac{1}{80}$ to $\frac{1}{40}$ —2 to 3 milligrammes). If the affected place is within reach of the vesical speculum, it may be curetted through this instrument and cauterized with a strong nitrate-of-silver solution. The bladder may be injected with iodoform glycerin (p. 406). Great relief is often afforded and sometimes a cure obtained by the establishment of an artificial fistula, through which the urine drains off, and affected places may be curetted. If only one of the kidneys is diseased and is extirpated, the tuberculosis of the bladder is often cured, which process may be furthered by the use of the aqueous extract of tubercle bacilli.

CHAPTER XI

DISEASES OF THE URETERS

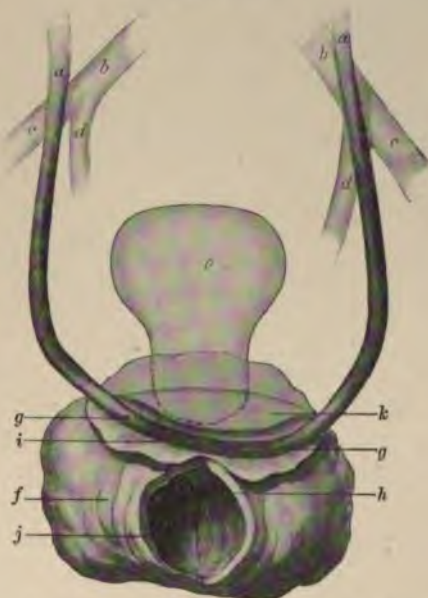
§ 1. **Course.**—The ureters¹ are two slender tubes leading from the pelves of the kidneys to the bladder. They are from 16 to 18 inches long, and have about the circumference of a goose-quill, but may be distended by stagnating urine to the thickness of the little finger. The width is not uniform. In certain places there are spindle-shaped enlargements, which are seen in Fig. 243, p. 276. At 8 the uterine artery passes in front of the pelvic dilatation, and at 16 the ovarian artery crosses in front of the abdominal dilatation. The knowledge of these wider and narrower portions of the ureter is in so far of practical importance, as it may help the surgeon to avoid the deplorable error which has been committed of mistaking the ureter for a vein and severing it. By pressure in the lower part of the pelvis the ureter becomes dilated and shows its wider space plainly, while the pressure exercised on a vein cuts off the blood-supply and makes the vein collapse. The ureter lies behind the peritoneum, embedded in very loose connective tissue, and is, on account of its somewhat serpentine course, much longer than the direct distance between its two ends. At the upper end the two tubes are $2\frac{1}{2}$ inches apart. From this point they descend almost parallel to each other to that where they cross the iliac vessels at the brim of the pelvis. In this portion of their course they lie in front of the psoas muscles. About midway they are crossed in front by the ovarian vessels; the right lies close to the outer side of the inferior vena cava, behind the ileum; the left lies behind the sigmoid flexure of the colon. They cross in front of the lower end of the common iliac artery or the upper end of one of its branches (Fig. 328), and enter the cavity of the pelvis, where they describe a large curve. First they diverge, running downward, backward, and a little outward on the wall of the pelvis to a point near the spine of the ischium. Then they bend downward, forward, and considerably inward, so as to converge towards the bladder. They lie outside of the internal iliac artery, behind the broad ligaments,—not in them, as usually stated,—extending to their

¹ Garrigues, "On Gastro-elytrotomy," New York Med. Jour., November, 1878. "Additional Remarks on Gastro-elytrotomy," Amer. Jour. Obst., 1883, vol. xvi. pp. 45-49.

base and then under them. At the brim of the pelvis they pass behind the ovarian vessels, where these turn inward in the infundibulopelvic ligaments. This must be remembered in tying these vessels. The ureter goes right through the large plexus of veins on the side of the cervix, and lies behind the loop formed by the uterine artery (Fig. 243, p. 276). It crosses the cervix from above and behind, forward and downward at a distance of about $\frac{1}{2}$ inch. When it reaches the bladder it turns rather sharply inward (Fig. 329), is embedded for $\frac{1}{2}$ inch in the wall perforating it gradually so as to form a kind of valve, and opens with a small longitudinal slit in the bladder, while the substance of the ureters continues as a ridge—the interureteric ligament—which forms the base of the trigone, each side of which is about 1 inch. The internal opening of the urethra, which is situated at its top, is level and crescent-shaped (Fig. 319, p. 391).

The distance between the interureteric ligament and the end of the cervix varies in different individuals. The author has found it in cadavers immediately under the os and $\frac{1}{2}$ inch (1 centimetre) lower down. When the bladder is distended, it increases to 1 inch.¹ In crossing the cervix the

FIG. 328.



The course of the ureters in a woman fifty-seven years of age, with atrophic uterus. Specimen drawn *in situ*. The ureters laid bare from the place where they cross the iliac vessels to the point where they pass under the broad ligaments. The bladder dissected from the uterine neck and upper part of the vagina and drawn down in order to show the curve of the ureters and the trigone. The broad ligaments have been removed and the bladder cut open in the median line, so as to show the inside of it. *a*, ureter; *b*, common iliac artery; *c*, external iliac artery; *d*, internal iliac artery; *e*, uterus (appendages cut off); *f*, bladder; *g*, *g*, sites of vesical apertures of ureters on inner surface of bladder (not visible); *h*, vesical aperture of the urethra; *i*, base of trigone (interureteric ligament); *j*, incision in bladder; *k*, vagina.

¹ Others indicate the distance from the lower end of the ureter to the os uteri as $3\frac{1}{2}$ centimeters ($1\frac{1}{2}$ inches). It must be taken into consideration that in the dead body the uterus sinks down at least an inch.

ureters touch the anterior part of the side-wall of the vagina on a surface as large as the tip of a finger.

During pregnancy the course of the ureter undergoes a great change, the middle portion being lifted up with the peritoneum.

FIG. 329.

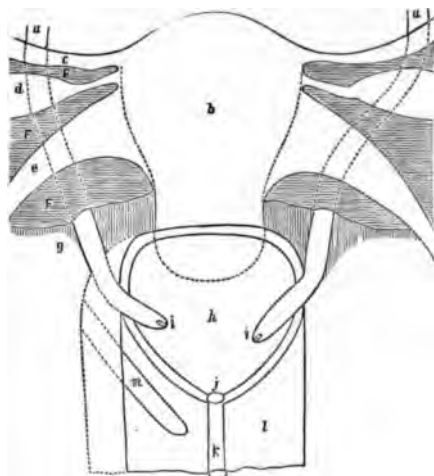


Diagram of uterus, ureters, and upper part of the vagina of a woman forty years old. (About one-half natural size.) All measurements were taken *in situ* with compasses and marked on the paper without regard to foreshortening. *a, a*, ureters; *b*, uterus; *c*, Fallopian tube; *d*, ovary; *e*, round ligament; *FFF*, broad ligament; *g*, connective tissue; *h*, bladder (the anterosuperior part removed to show attachment to cervix and vagina); *i*, vesical openings of ureters; *j*, inner aperture of urethra; *k*, urethra; *l*, vagina; *m*, incision and rent in gastro-elytrotomy.

cords about $\frac{1}{8}$ inch wide. They may be displaced laterally and hooked up with the tip of the index-finger. In the posterior part of the pelvis they may be felt through the rectum, especially if catheters are introduced into them through the urethra and bladder. When diseased, the ureter becomes thicker and nodular, and may be mistaken for cellulitis or an adherent ovary. Above the pelvic brim their course can also be felt for a short distance through the abdominal wall when they are made more resistant by the introduction of catheters.

Cystoscopy.—The ureteral openings may be made visible by dilating the urethra and applying Kelly's vesical speculum, and through this catheters may be inserted. But the examination and treatment of the ureters have been particularly developed and simplified both for

Behind the transverse diameter of the pelvis it lies on the wall of the false pelvis. At the end of this diameter it dips down into the true pelvis and extends in a curved line downward, forward, and inward to the bladder, as in the unimpregnated condition.

§ 2. *Methods of Examination.*—The ureters may be examined by means of palpation, cystoscopy, and catheterization.

Palpation of the Ureters.—

In nearly two-thirds of their course the ureters may be felt in lean subjects. In the anterior portion of the pelvic cavity they can be directly palpated by pressure against the wall of the pelvis, to the sides and in front of the cervix. They are felt here as round, flattened

the gynecologist and the patient by the invention and gradual improvement of the galvanic cystoscope, by means of which not only the whole interior of the bladder, inclusive of the two ureteral openings, can be seen but also a catheter may be carried into the ureter and all the way into the pelvis of the kidney. If the ureter is inflamed, its vesical opening becomes red, and pus may be seen to enter the bladder through it. In renal or ureteral hemorrhage the blood can be seen escaping through one or both openings. With the catheter stones can sometimes be felt, and through it the ureter and renal pelvis may be irrigated with boric acid or nitrate-of-silver solution.

If there is only one ureteral aperture, and that placed laterally, there is the greatest probability that the individual has only one kidney, and that consequently nephrectomy is barred. But if the opening is situated in the median line, there may be two kidneys and two ureters, which unite before reaching the bladder. One or both ureters may also have an abnormal course and open in an unusual place, as we presently shall see in studying malformations.

If the catheter meets with any resistance, it should be drawn back a little and a solution of cocaine hydrochlorate injected through it, which relieves spasm and sensibility. A persistent resistance means a real obstruction, which cannot be overcome. In tuberculosis the ureter may be filled with a cheesy mass, which prevents progression, but then some of this substance will be seen in the eye of the catheter after withdrawal.

In order to avoid the difficult and painful repeated insertion of the catheter, this may be fastened with a silk thread to the meatus and left in position for days.

By giving methylene blue (5 to 10 centigrammes—gr. i to 1 ss) by the mouth, some hours before examining the bladder, the urine takes a greenish-blue color. If the bladder is washed out and injected with boric acid solution, the colored urine does not mix with the colorless fluid. In this way the permeability of both ureters may be demonstrated more convincingly.

The cystoscope has been modified in such a manner that a current of clear solution of boric acid may be made to pass through it and keep the bladder clean during the examination when otherwise blood or pus would obscure the view. The instrument has also been arranged so that by an exposure lasting a few seconds the small picture formed in the tube can be magnified and photographed. Such an illustration is shown in Fig. 319, p. 391.

Catheterization.—If it is proved that one kidney is tuberculous, and it is deemed advisable to extirpate it, it must be ascertained that the other is present and in healthy condition. This may be done by catheterizing the ureter on the healthy side, but there lurks the danger that in so doing tubercle bacilli might be carried into it with the catheter from the bladder. This is entirely avoided by collecting the urine separately from the two ureters into Rose's speculum (p. 42).

§ 3. **Malformations.**—One ureter and the corresponding kidney may be *absent*. One or both may be *double*. The supernumerary one may extend to the bladder or end blindly. There may be a congenital atresia. One or both may open in an abnormal place,—the vagina, the rectum, the mons Veneris, or the urethra. If one ureter opens in the urethra and the other in the bladder, there is a constant dribbling of urine from the urethra, besides an evacuation of the bladder at intervals.

Treatment.—When a ureter takes such an abnormal course, it can be dissected loose from its faulty connections and implanted into the bladder.

§ 4. **Injuries.**—Injuries to the ureters, which formerly were exceedingly rare, have become much less so since the frequent performance of hysterectomy and other pelvic operations. One or both ureters have been *ligated*, which leads to hydronephrosis, vomiting, and uræmia. In operating for vesicovaginal fistula, sutures may embrace and constrict the ureter. In the extirpation of intraligamentous tumors the operator must be on the lookout for it at the base of the tumor. Its course lies nearly in an anteroposterior direction, and it is recognizable by greater hardness than the surrounding tissue.

A *ureterovaginal fistula* may result from the gnawing of a pessary or be due to pressure between the fetal head and the pelvic wall in childbirth, which may produce also a ureterocervical fistula.

Treatment.—The formation of fistulæ in childbed can most often be prevented by a timely recourse to the obstetric forceps. In order to mark and avoid the ureters in hysterectomy and the removal of tumors, flexible probes of hard rubber may before the operation be inserted into the ureters. In tying the ovarian vessels in the infundibulopelvic ligament the gynecologist must avoid going deeper than necessary, since the ureter lies behind them. In operating on the sides of the cervix, the bladder and ureters must be loosened and

brought forward. In fistula operations the ureter is endangered as soon as the field of operation extends more than $\frac{1}{2}$ inch from the median line. Sometimes the opening of the ureter can be seen on the edge of the fistula. In such cases and if there otherwise is not room enough to place the sutures without interfering with the ureter, it may be slit open to the extent of $\frac{1}{2}$ inch and left to heal before the vesicovaginal fistula is operated on.

If symptoms of hydronephrosis develop after laparotomy, it would be indicated to cut the ligature around the uterine artery 36 hours after the operation.

If the ureter has been wounded in a laparotomy, it should be repaired at once. A lateral wound is mended by uniting its edges with sutures, avoiding the mucous membrane. If the ureter has been cut across, it may, perhaps, be feasible to implant the upper portion into the bladder (p. 189), and tie and cut the lower. If not, the two ends may be brought together and sutured; but then it is safer to perform *Van Hook's invagination*. In this operation the end of the lower portion of the ureter is closed with sutures. A longitudinal incision, $\frac{1}{4}$ inch long, is made in its wall below the closed end. A slit is made also in the end of the upper portion, in order to make the opening larger, and a catgut suture, with a needle at each end, is carried through the wall opposite to the slit, from within outward. Next, the needles are passed through the opening made in the lower portion and pushed through the wall $\frac{1}{2}$ inch below the incision. By gentle manipulation the upper extremity is drawn into the lower, and, the sutures being tightened and tied, the slit is entirely occluded.

If no conservative method is available, the corresponding kidney must be extirpated; or if the patient is in too low a condition to support this additional shock, an opening may be made in the lumbar region and the upper end of the ureter sutured to its edges. The lower end is closed and fastened in the lower end of the abdominal wound, and the bladder is drained through a self-retaining catheter. A flexible catheter is passed into the ureter in the loin, and a piece of rubber tubing attached to it leads the urine into a bottle with boric acid solution. If the lower end reopens, it is treated in the same way.

§ 5. **Obstruction.**—The ureter may become imperviable through the impaction of a stone or compression from without.

A CALCULUS entering the ureter may, if it is small enough, pass through its whole length and fall into the bladder without doing any harm, and even without being felt. A larger stone is arrested at one

of the narrow portions of the canal, especially about two inches below the kidney, or at the vesical aperture. The passage of a stone, particularly if it is irregular in shape, with sharp points or edges, causes severe pain in the corresponding flank, accompanied by vomiting. The ureter above the stone as well as the kidney, may become dilated and sensitive. The patient must urinate frequently, and the urine sometimes is bloody. When the gravel enters the bladder, the pain suddenly ceases. In impaction these symptoms are aggravated; and if the obstruction is not removed, hydronephrosis and destruction of the kidney must follow.

Diagnosis.—Renal colic differs from *hepatic colic* by not being limited to the right side, by not being accompanied by jaundice, and by the normal character of the stools, while in cases of occlusion of the hepatic duct or the ductus choledochus the fæces become dry, clayey, and whitish. In renal colic the urine is bloody or purulent.

The stone, if situated in the pelvis, can be felt from the vagina or rectum. In lean subjects it may be palpated also through the abdominal wall. Otherwise it may be made visible and photographed by X-rays. It may also be felt as an obstruction in catheterizing the ureters and by using the vesical speculum and wax-tipped bougies; impressions or scratches may be seen on these after the contact with the concrement.

Treatment.—Pain and spasm should be relieved by sufficient doses of morphine and atropine, and the passage of the stone furthered by copious draughts of bland drinks. If it remains impacted, it should be removed by operation. In the pelvis it may be reached by vaginal or abdominal incision or by performing Kraske's resection of the sacrum (see DISEASES OF THE RECTUM). In its abdominal course the ureter is laid bare from behind without opening the peritoneal cavity. After incising it and withdrawing the calculus, the wound in the ureter should be closed immediately with sutures. If the ureter has been injured much by the presence of the stone, the diseased portion may be resected and the ends united by Van Hook's anastomosis. As after-treatment, the same diluent drinks and mineral waters are indicated as during the passage of the stone, to which may be added borocitrate of magnesium (1 drachm—4 grammes—in a tumblerful of water t. i. d.).

COMPRESSION FROM WITHOUT may be due to inflammatory exudation or a tumor, especially myoma or carcinoma of the uterus. The symptoms are similar to those caused by internal obstruction. The

ureteral catheter is arrested at the compressed point, or if it passes, it evacuates decomposing urine from that portion of the ureter which is situated above the obstruction.

Treatment.—If the compression is due to inflammatory exudation, this should be resolved, according to circumstances, by an ice-bag, ice-water coil, Priessnitz's compress, tincture of iodine applied to the abdominal wall or the vaginal roof, and ichthyol-glycerin or ointment. The constriction may be gradually dilated with ureteral bougies. If, on the other hand, the pressure is caused by a uterine or ovarian tumor, this should be removed or, perhaps, the uterus amputated or extirpated.

§ 6. *Ureteritis.*—Inflammation of the ureter is rarely limited to that organ. Commonly it is propagated from the bladder or the kidney or the tissue through which the ureter passes. Or the inflammation is produced by the irritating effect of a stone passing through or impacted in the canal. It may be gonorrhœal or tuberculous, but most often it is of septic origin. It may also be due to pressure caused by the descent of the fetal head through the pelvic canal. One or both ureters may be affected. From the ureter the inflammation may spread to the surrounding connective tissue—*periureteritis*. The wall is thickened and the lumen often irregularly dilated and contracted.

Symptoms.—The patient has a frequent desire to pass the urine. She complains of pain in the abdomen and pelvis. The urine is highly acid, scant, and contains blood and pus, and sometimes casts of the canal. The ureter is sensitive to touch and is felt swollen. With the cystoscope, purulent and bloody urine may be seen to enter the bladder. The urine may be collected separately from each side, showing whether the disease is unilateral or implicates both ureters. If the free discharge of urine is impeded, symptoms of hydronephrosis and uræmia supervene.

Treatment.—An accompanying cystitis should be treated, as stated above, with irrigation. Hot vaginal douches and high rectal enemas of hot water, and warm linseed-meal poultices afford relief. The bowel should be kept loose with saline aperients. Diuretic and alkaline mineral waters—Poland, Waukesha, Buffalo Lithia, French Vichy, Wildungen, etc.—and other bland beverages, such as almond milk or flaxseed-tea, should be freely taken. The urine should be made sweet by the administration of salol, urotropin, or cystogen. In more protracted and severe cases the ureter should be catheterized and washed out with boric acid or silver nitrate.

CHAPTER XII

DISEASES OF THE RECTUM AND ANUS

§ 1. **Malformations.**—1. **ATRESIA ANI.**—By an arrest of development the tunnelling of the tissues between the intestine and the skin by which normally the anus and anal canal are formed, may fail to take place (Fig. 121, p. 115). If in the new-born child there is only a more or less thin septum between the rectum and the anus or the skin at the point where the anus should be, it should be split by a crucial incision and the rectum sutured to the skin.

But the whole rectum may be absent, or, perhaps, the descending colon also. The intestine may end as a blind sac more or less far up in the pelvis, or it may open into one of the hollow organs,—the uterus, the vagina, the bladder, or the urethra. The pelvis of the new-born, measuring only from 1 to 1½ inches in diameter, it is exceedingly difficult to perform any operation in so narrow a space; and the mechanical difficulties created by the lack of room are enhanced by the obscurity of the condition of the deeper parts.

If the bowel cannot be reached from below, the question of the advisability of giving an outlet to the fæces by means of colostomy or enterostomy presents itself. Under ordinary circumstances the parents will probably refuse their consent to the performance of an operation that leaves the child for life in a condition which requires so much care and lays such a heavy burden on the individual. But sometimes great interests are connected with the child's life. If determined upon, right lumbar colotomy is indicated on account of the possibility of the absence or malposition of the descending colon; but the prognosis of so great an operation in so young a child is very doubtful.

2. **CONGENITAL PRETERNATURAL ANUS.**—The anus may open in the fossa navicularis (Fig. 120, p. 114) or in the vagina (so-called *atresia ani vestibularis* or *vaginalis*). It may have a sphincter or not. In other cases the vagina and the urethra apparently open into the rectum. All these anomalies are in reality due to a *persistent cloaca*, the septum that normally should develop between the rectum and the urogenital sinus (Fig. 119, p. 113) being defective.

A congenital *rectoperineal fistula* is due to imperfect coalescence

between the side walls of the cloaca, by which a canal is left extending from the rectum to the perineum.

Treatment.—If the preternatural anus has a sphincter, it is better not to interfere with it, as by the operation nerve connections might be severed and the woman left in a worse condition after the operation than she was before. Otherwise the intestine may be dissected off from its faulty place and sutured to the anus.

A rectoperineal fistula may be closed by carrying an elastic ligature through it and the anus and tightening it.

§ 2. *Rectocele.*—The protrusion of the anterior wall into the vagina has been described on p. 174.

§ 3. *Prolapsus Recti.*—As we have seen above that the vagina, the uterus, and the bladder may be expelled from the pelvic cavity, so also the rectum may protrude through the anus. The prolapse

FIG. 330.



Prolapse of all the coats of the rectum. (Busche.)

may be limited to the mucous membrane or implicate the whole intestine. Douglas's pouch may become obliterated and the small intestine come out together with the rectum. The protrusion constitutes a cylindrical mass of a pink color, from 1 to 3 inches in length, with transverse ridges and furrows and a central opening leading into the gut (Fig. 330).

If this body is allowed to remain outside, its walls become thickened, the ridges are obliterated, the color becomes darker, and the epithelium takes the character of the epidermis. At first there is only a small prolapse of the mucous membrane, which is easily replaced; but gradually the other coats of the intestine participate in the prolapse, which becomes more spherical, of the size of an orange, and difficult to reduce. The surface may become inflamed and is then covered with pus or is the seat of ulcerations.

Prolapse of the intestine causes discomfort in walking. It may

give rise to hemorrhage, which by being repeated weakens the patient; it may produce peritonitis; or it may become strangulated, which leads to gangrene and serious general symptoms, such as vomiting, fever, and adynamia. In the course of time the sphincters become insufficient and the patient can no longer retain flatus and fæces.

Prolapse is quite common in little children affected with diarrhœa. In the adult it is apt to arise in consequence of dysentery, polypi, hemorrhoids, repeated pregnancies, and child-births, which loosen the connective tissue in the pelvis, protracted cough, as in chronic bronchitis, or a tumor pressing on the rectum.

Diagnosis.—The condition is easily recognized by its location and characters, especially its central opening and the continuity of the tumor all around with the skin at the anus. *Hemorrhoids* form separate tumors, each of which does not cover the whole circumference of the intestine. A *polypus* is also a lateral and pedunculated tumor. *Carcinoma* is characterized by its hardness and painfulness.

The *prognosis* depends upon the stage of the disease. In the beginning, while it is reducible, it is easily cured; later, when it has become large, hardened, and irreducible, it is difficult to remedy.

Treatment.—In its mildest form it may be cured by reducing the prolapsed mucous membrane and inserting a tampon soaked in tannin-glycerin (3i to 3i—4 grammes to 30). If the stools are hard, a laxative should be prescribed. The faradic current, with one electrode in the rectum, the other near the anus on the skin, or a bipolar electrode in the gut, strengthens the tonus of the sphincters. Hypodermic injections of strychnine have the same effect. *Nux vomica* and *ergot* are also recommended. Thure Brandt obtains the same by certain gymnastic movements. In fact his successful treatment of a soldier suffering from prolapse was the starting-point of his treatment with massage which came to play a considerable rôle in gynecology. If these remedial agents fail, recourse must be had to operations. With Paquelin's cautery four lines are made in the direction of the canal of the intestine, and the patient kept constipated for a week by giving opium and purely animal food. A similar contraction may be obtained by cutting off folds of mucous membrane and uniting the edges by suture. A triangular piece may be cut out from the anterior or posterior wall of the rectum including a portion of the sphincter, and the edges united.

Roberts's Operation (Fig. 331).—The patient is placed in lithotomy position, and the prolapse reduced. An incision, large enough to

admit the index, is made in the median line of the perineum, near the coccyx, and the connective tissue behind the rectum torn. By introducing the knife into the anus, a triangular portion of tissue, consisting of skin, connective tissue, and an inch in width of the sphincter ani is excised. The base of the triangle is at the margin of the anus. With scissors a long triangular piece is next cut out of the posterior wall of the rectum, the apex of which is about 3 inches up the gut, while the base corresponds with the piece excised from the sphincter. Hemorrhage is controlled with catgut ligatures, and the rectal wound is closed with chromicized catgut sutures, which are tied from the rectal side. The operation renders the lower part of

FIG. 331.



Roberts's operation for prolapsus recti.

the bowel funnel-shaped, with the small end of the funnel towards the anus.

§ 4. *Injuries.*—Injuries of the rectum are, on account of its deep position and the protection afforded by the bony pelvis, infrequent. They may, however, occur by a fall on a pointed object, for instance, in sliding down a hay-rick and landing on a pitch-fork; when a chamber-pot breaks under the patient and sharp sherds are pressed against her perineum, or a chair upon which she is standing collapses, etc.

A neglected or forgotten vaginal pessary may burrow into the rectum. Straining at stool when the intestine contains hard scybala may result in a rupture of it. Labor pains may have a similar effect.

More often the rectum is wounded by the surgeon's knife, either accidentally or with premeditation. In performing colpoperineorrhaphy, the operator comes close up to the rectum and may enter it involuntarily. That is one of the reasons why the author prefers to separate the vagina from it bluntly, and introduces the finger into it

while passing the sutures. In operations for chronic salpingo-oöphoritis or carcinoma uteri, the gynecologist may find it necessary in order to accomplish the removal of the diseased tissues to sacrifice a portion of the intestine.

Symptoms.—The patient complains of pain in the wounded region. There may flow more or less blood from the anus. Later this may be replaced by pus or mucopus. If there has been established a connection between the rectum and the vagina, fecal matter shows in the latter. If the intestine communicates with the bladder, the fecal matter may be passed through the urethra, or urine through the anus. Very rarely emphysema appears and spreads over the lower half of the body.

Prognosis.—The prognosis depends much on the situation and depth of the wound. Great loss of blood may produce syncope and death. If peritonitis develops, it usually has a fatal issue. The inflammation of the rich connective tissue surrounding the rectum is less dangerous, but may give rise to a permanent fecal fistula. Still, in most cases of injury to the rectum the patient recovers.

Treatment.—The most urgent indication is to stop hemorrhage, which may be met by tying bleeding vessels or, if they cannot be reached, by tamponing both the rectum and the vagina, and placing an ice-bag on the hypogastric region. If tamponing is not called for, but there still is some bleeding, it may be checked by permanent irrigation of the rectum and vagina with ice-water, for which Kemp's double-current nozzle (Fig. 56, p. 59) will be found serviceable. The ice-bag has also considerable value in combating pain and preventing inflammation. Pain is, of course, subdued also by the administration of opiates. If an abscess forms in the periproctitic connective tissue, it should be ripened by hot flaxseed-meal poultices and incised from the skin as soon as fluctuation is well established. The cavity is disinfected and dressed with iodoform gauze.

§ 5. **Foreign Bodies.**—Foreign bodies are not of rare occurrence in the rectum. They may have been introduced through the anus, or the mouth, or developed in the intestine.

The greatest variety of objects, and sometimes of an astounding size, have been introduced, either by the patient herself or, more commonly, by others.

False teeth, coins, jewelry, pins, keys, etc., are often swallowed accidentally or on purpose. Children in their play often happen to swallow objects they hold in their mouth. Most women have the

bad habit of talking while they hold pins between their lips or teeth, and not rarely swallow them. Many persons in eating fish do not pay sufficient attention to the bones. Some freaks make a business of swallowing all sorts of incongruous objects, and some maniacs are apt to do the same.

The large intestinal worms (*ascaris lumbricoides*) may congregate and coil up till they form a large knot, constituting a true foreign body. Fecal matter may form a large, globular mass, hard as stone, which obstructs the intestinal canal, or often only irritates it, allowing thin fæces to pass around it.

Most small objects, such as pins, fish-bones, buttons, etc., pass the whole length of the intestinal canal without giving rise to any symptoms, but in other cases these are uncomfortable or even grave. There generally is pain, pressure, a sensation of weight near the anus, sometimes extending to the lumbar or crural region. There is a frequent or constant desire to defecate. The bowels may be constipated, or there may come thin fæces, often mixed with blood or mucus; but even then the patient has a distinct feeling that there is something remaining that should come out. If the intestine is obstructed, resorption takes place, the breath is offensive, the head becomes dull, and the patient gets nervous or complains of headache. The foreign body may cause inflammation of the rectum, the surrounding connective tissue, the uterus, or the bladder. Abortion may occur, or the rectum may become gangrenous.

The *diagnosis* is sometimes given by the history, but may in other cases be very difficult. Usually a physical examination is required. One or two fingers may be introduced into the vagina or the rectum and palpate the object. Even the whole hand can be passed if it is necessary for the diagnosis, but then the patient must, of course, be anæsthetized.

The *prognosis* is in most cases good.

Treatment.—The treatment must depend much on the size and shape of the foreign body. In case small objects have been swallowed, it is best to envelop them with a pultaceous mass, by feeding the patient with oat-meal, peas, bread-crumbs, etc., and give little liquid food.

If a coprolith is lodged in the rectum, it should be softened by injecting half an ounce of glycerin and then broken up and removed with the index-finger and the handle of a spoon. If worms obstruct the canal, extractum sennæ et spigelie should be given by the mouth,

and a strong infusion of quassia (℥ii to ℥i—60 grammes to 500), or bichloride of mercury, $\frac{1}{2}$ grain (3 centigrammes) dissolved in 8 ounces (250 grammes) of water, should be injected into the rectum.

Foreign bodies, whether swallowed or inserted through the anus, should, if possible, be removed through the latter. Much space is gained and resistance overcome by beginning by overstretching the sphincter,—that is to say, opening it under anæsthesia till the two thumbs simultaneously touch the tuberosities of the ischia. Strong forceps, and even shears, may be needed to seize or diminish and extract the body. A pig's tail was once extracted by attaching a string to it and passing a hollow reed over it, which pushed the mucous membrane away from the bristles and surrounded the tail until it could be withdrawn, together with the tube. If the body is very voluminous, such as a tumbler, it may be necessary to make a longitudinal incision through the posterior wall of the rectum (posterior *proctotomy*), or to slit open the rectovaginal wall, which incisions should be immediately closed with sutures. If the body is situated beyond reach from below, laparotomy must be performed, and the intestine incised and sutured after extracting the body.

§ 6. *Proctitis*.—The rectum may be the seat of *acute or chronic* inflammation. In the acute form the mucous membrane is swollen, red, and covered with mucus or mucopus. In the chronic the color becomes more purple or bluish-gray. The whole wall is thickened, the mucous membrane ulcerates, and strictures may develop. Often venereal vegetations are found in the anal canal and on the surrounding skin, or these may be the seat of a chancre or chaneroids.

The inflammation may be due to constipation, inflamed hemorrhoids, the use of acrid aperients, or to the presence of intestinal worms. It may be brought about by sodomy, and is often of gonorrhœal origin, the infection taking place by specific discharge dribbling from the genitals or being introduced by the nozzle of a contaminated syringe or the finger in a gynecological examination. It may arise also from the presence of a fish-bone or other foreign body.

The patient complains of pain in the sacral and perineal region. Defecation is very painful, and often there is also dysuria. The bowels are in the beginning constipated and frequently the seat of tenesmus. There is a mucous, mucopurulent, or bloody discharge. The anus is red, hot, and very sensitive. The sphincters are strongly contracted. The patient may be feverish. In the later stage the bowels are loose, or diarrhœa alternates with constipation. The

inflammation may spread to the neighboring connective tissue and end in the formation of an abscess. Not seldom fistulæ develop.

Diagnosis.—In *dysentery* the fever is higher, the pain is spread all over the abdomen, and the stools contain characteristic shreds of the mucous membrane.

The *prognosis* is favorable.

Treatment.—Lukewarm enemata of starch with laudanum are both soothing and healing. Bismuth subnitrate may be added to advantage, a heaping teaspoonful to a cup. The injection forms a protecting film over the inflamed mucous membrane, and may be repeated three times a day or oftener. Warm sitz baths and vaginal douches also subdue pain.

Sulphate of zinc, alum, or tannin, gr. x-xxx (60 centigrammes to 2 grammes), or silver nitrate, gr. i to ii (6 to 12 centigrammes), dissolved in 8 ounces (250 grammes) of water, may be substituted when the acute pain and tenesmus are past. Suppositories with 5 grains (30 centigrammes) of iodoform, to which may be added extractum belladonnæ, gr. $\frac{1}{4}$ (15 milligrammes), or extractum hyoscyami or pulv. opii gr. $\frac{1}{2}$ to 1 (3 to 6 centigrammes), may be inserted three or four times a day.

In the chronic variety ulcers should be curetted and touched with nitric acid.

If the disease is of gonorrhœal origin, injections with $\frac{1}{4}$ to $\frac{1}{2}$ per cent. protargol should be used before other astringents. Chancroids and chancres are treated as described under VENEREAL DISEASES (pp. 148, 150).

§ 7. *Periproctitis.*—Inflammation around or near the rectum may occur in three anatomically different localities and may according thereto be called *superficial*, *middle*, or *deep*. The *superficial* consists in a circumscribed inflammation of the skin and the nearest portion of the connective tissue of the posterior perineal triangle between the os coccygis, the tuberosities of the ischia, and the ischio-perineal ligament. The *middle* is situated in the depth of the abundant adipose connective tissue surrounding the rectum and filling the large ischio-rectal fossa, under the levator ani muscle. The *deep* inflammation develops in the connective tissue between that muscle and the peritoneum.

1. The *SUPERFICIAL ABSCESS* is due to lack of cleanliness or appears as part of a general furunculosis in weak subjects. It arises from the occlusion of one or more of the large sudoriferous and se-

baceous glands in which the clunic region abounds. It forms a red, painful swelling of the size of a hazel-nut, surrounded by hard infiltration, and usually soon ruptures on the skin, evacuating dark offensive pus. This little abscess heals in a few days, unless it be of tuberculous origin, when it remains for weeks or months and often ends in the formation of a fistula.

Treatment.—In the beginning cold applications should be made, or the region covered with antiphlogistine. When it becomes clear that suppuration has begun, flaxseed-meal poultices should be substituted, and when fluctuation is established, the abscess should be opened with an incision, painted with undiluted carbolic acid, washed with alcohol, and dressed with iodoform gauze.

2. The PHLEGMON, OR CELLULITIS, OF THE ISCHIORECTAL FOSSA is a much more serious matter. It may be propagated from proctitis, but may begin also in the depth of the connective tissue, probably in consequence of the immigration of the bacterium coli commune. This inflammation, situated in loose connective tissue and confined between two layers of fascia, the superficial perineal and anal fascia, has a great tendency to spreading. It may be bilateral and the two halves may then communicate behind the rectum, forming a *horseshoe-shaped abscess*, or surround it as a *circular abscess*; or it is limited to one side as an *abscess of the ischiorectal fossa*. It causes a deep-seated pain, exacerbated by the passage of hard fæces. The skin becomes swollen, dark-red or purple, sensitive, and hard. The patient has high fever, and may become delirious. Fluctuation is felt most distinctly by inserting one finger into the rectum and laying those of the other hand on the skin. The abscess may destroy the wall of the rectum and point right under the mucous membrane or form a fistula there. Even gangrene may set in, when the skin becomes dark and covered with blisters, from which escape gas bubbles. This condition is accompanied by profuse and highly offensive diarrhœa. It is particularly liable to develop, if there is an escape of urine or fecal matter into the tissue. It is most grave and may end in speedy death.

Treatment.—In the beginning the treatment is the same as for the superficial form,—cold applications, warm poultices,—but as soon as the presence of pus can be ascertained, the abscess should be opened in its full length by an incision through the skin. If there is a fecal fistula a wooden director should be inserted into the rectum and all the intervening tissue, inclusive of the sphincters, cut with one sweep. Bleeding vessels should be tied, or, if the knife has to go

through much tissue, the thermocautery may be substituted. The operator will, of course, keep at a proper distance from the internal pudic artery. The abscess cavity should be disinfected and dressed as stated above.

3. The DEEP PELVIC PHLEGMON, OR PELVIC CELLULITIS, may be due to inflammation of the uterus, bladder, or rectum, inflamed hemorrhoids, or caries of the sacrum or sacro-iliac joint. The connective tissue around the rectum is a direct continuation of that which surrounds the neck of the uterus, enters between the layers of the broad ligaments and is located in the sacro-uterine ligaments (Figs. 332, 333).

FIG. 332.



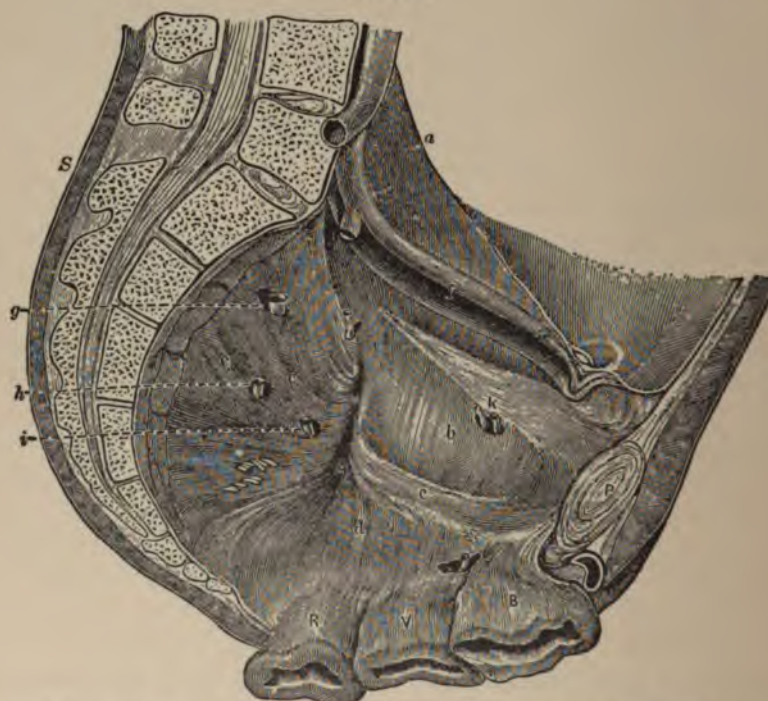
Coronal section of pelvis showing the three spaces—the peritoneal, the subperitoneal, and the subcutaneous. (Luschka.)

This variety of proctitis gives rise to a deep-seated pelvic pain or sensation of weight, fever, painful defecation, and general malaise. As a rule, it opens into one of the hollow organs,—the vagina, the rectum, or the bladder. Rarely it forces the barrier formed by the levator ani muscle and its double fascia, and may then open on the skin of the ischio-rectal fossa; but the opening is small and the fistulous tract long.

Treatment.—Before suppuration sets in, an ice-bag is applied to the lower portion of the abdomen, and hot vaginal and rectal injections are administered every three hours. If an abscess forms, and can be

reached from the vagina, it is best to make the incision there and follow it up with the blunt perforator and drainage. If it breaks with an insufficient opening through the skin, the outlet should be enlarged with the knife and in the deeper parts bluntly with dilator or tents until there is room enough for establishing proper drainage. If it communicates with the rectum, a curved uterine sound should be introduced

FIG. 333.



Fascia of pelvic floor. (Savage.) B, bladder; V, vagina; R, rectum; P, symphysis pubis; S, sacrum; a, fascia covering psoas muscle; b, obturator fascia; c, tendinous arch; d, reflexion of the fascia on the rectum, vagina, and bladder; e, posterior portion of the fascia covering the sacral vessels and nerves; f, iliac fascia covering iliac vessels; g, gluteal vessels; h, sciatic vessels; i, internal pudic vessels; k, obturator vessels.

through the anus and the hole in the intestine and a counter-opening made in the vagina. Through this incision a double-current soft-rubber drainage-tube is introduced into the abscess cavity, which is kept clean by daily injection of antiseptic fluid. When there is no longer any discharge of pus, the tube is withdrawn. In the meantime the rectal fistula has closed, and the vaginal opening does so soon after.

If ever possible, the surgeon should avoid making an incision

in the rectum, as this causes constant infection of the abscess cavity; and if on account of serious symptoms and the urgency of the case he is obliged to do so, he should try to make a counter-opening in the vagina and establish free drainage.

§ 8. **Stricture.**—A stricture of the rectum is a cicatricial narrowing of a portion of it. It is generally situated low in the gut, a little above the anus. It is of annular shape.

It may be caused by dysenteric or tuberculous ulcers, followed by contraction of the surrounding connective tissue. But most frequently it is of syphilitic origin and produced by sodomy. The narrowness, due to carcinoma, will be considered later.

The stricture opposing an obstruction to the passage of the fæces, its edges are liable to ulcerate, which aggravates the formation of cicatricial tissue and narrowing of the bowel.

The condition is characterized by constipation and difficult defecation. At first the fæces become smaller in circumference, then tape-shaped, and, finally, only liquid fecal matter can pass. By introducing a finger, the obstruction is easily felt.

Treatment.—Palliatively, the ring may be dilated with rectal bougies well lubricated. If the history reveals the presence of syphilis, a specific treatment should be added. Tuberculous ulcers should be curetted and cauterized, and, as after-treatment, iodoform suppositories or tampons soaked in iodoform-glycerin should be prescribed.

Before any operation on the rectum, the patient should for several days take salol, and immediately before the operation the gut should be cleaned with an enema and a disinfecting irrigation. Next, the sphincter should be overstretched and a longitudinal incision made on the posterior wall through the stricture, and the edges of the cut should be united transversely, by which much space is gained. If feasible, it would be still more effective to cut out the whole narrowed ring and unite the upper and the lower end of the bowel with sutures.

If the stricture is very tight and causes much suffering, an artificial anus may be made, either in the left inguinal or lumbar region or at the end of the sacrum, after Kraske's resection for carcinoma.

§ 9. **Fecal Fistula.**—The communication between the intestine and the genital canal has been discussed in connection with the DISEASES OF THE VAGINA (pp. 191–195).

It remains to describe another kind of fistula, called *fistula in ano*, a tubuliform ulcer, which extends from the rectum to or through the skin near the anus, or dips from an opening in the skin into the

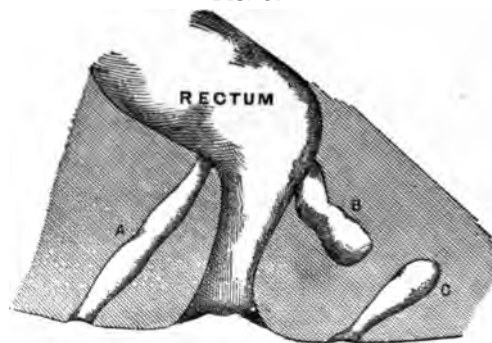
connective tissue surrounding the anus. The name means, in Latin, a flute. If the tube is open at both ends, it is denominated a *complete* fistula; if it has only one opening, it is termed an *incomplete*, or *blind*, fistula, which latter is subdivided into the incomplete *internal* variety, the aperture being in the rectum; and incomplete *external*, the fistula extending from the skin more or less deep into the connective tissue around the rectum without opening into it (Fig. 334).

The fistula may be *superficial*, or *subcutaneous*; *deep*, or *sub-sphincteric*; *subfacial*, i.e., lying under (deeper than the anal fascia), or *subperitoneal*, i.e., situated under the levator ani muscle and the rectovesical fascia.

In any fistula we distinguish the outer opening, the inner opening, and the intermediate portion.

The superficial fistula lies under the skin. Its outer opening is

FIG. 334.



Fistula in ano. A, complete; B, blind internal; C, blind external variety.

mostly lateral and single. Internally it opens below the sphincter, right at the entrance to the anal canal. But it is not rare at all that, besides this superficial branch, another extends an inch or two up at the side of the rectum and opens there.

The subsphincteric fistula opens generally just above the sphincter internus muscle or between the sphincter externus and internus. But frequently, while the opening is here, the fistula extends much higher up. There may be one or several outer openings. They are quite small and often surrounded by a little red swelling. If there are several apertures, their canals often communicate. The inner opening may be a small round point, or form a large, irregular ulcer.

The subperitoneal fistula may extend far into the pelvis, reach the crest of the ilium, or pass farther up towards the kidney.

A fistula may be caused by a foreign body,—for instance, a fish-bone, perforating the wall of the rectum,—and is then of little importance, but much more frequently it is of tuberculous origin and the sign of a poor constitution. It is also slow to heal and may undermine the general health. The deep, subperitoneal fistula may remain after an abscess in the connective tissue of this region.

The common symptom that calls the patient's attention to something being out of order is a scant, purulent, malodorous discharge, which soils her clothes. It may also irritate the surrounding skin and produce itching, erythema, or eczema. At times the outer opening may close up and then there is an unpleasant sensation of tension and heaviness.

In internal blind fistula the discharge comes through the anus, and the anal region is congested and tender on pressure.

The physical examination is best performed in Sims's position. The left index-finger is inserted into the intestine and a silver probe through the outer opening, or some point where it appears only covered by epidermis. If there is an inner opening the probe meets the finger. In a blind external fistula it only penetrates more or less into the tissue and is then arrested. In the blind internal variety no outer opening is discovered, but the region around the anus is infiltrated and the finger in the bowel causes unusual pain. A deep fistula is recognized by the amount of tissue intervening between the probe and the finger in the rectum.

The *prognosis* of a rectal fistula is always somewhat serious. Some are opposed to surgical treatment, because they look upon the fistula as a kind of safety valve, and believe that after its closure tuberculosis advances more rapidly in the lungs, a view which, however, is not sustained by modern pathology.

Treatment.—A subcutaneous fistula is simply split open from a directory passed through its course. It is well then to curette the course and dress with iodoform gauze.

A subsphincteric fistula is treated in the same way, which entails severance of the sphincter. This ought not to be done in more than one place, as incontinence would probably follow. After having been split the fistula may be cut out *in toto* or scraped and dusted with iodoform, and then the wound should be closed again with suture, in order to unite the separated ends of the muscle, for which purpose it is overstretched before being severed. If there are several fistulous ulcers extending towards the rectum, it is best even to open them from

their outer openings as far as the sphincter, but spare the muscle. The inner portion of the canals is dilated, curetted, and rubbed with iodoform, and the wound is dressed with iodoform gauze.

If a fistulous tract extends from the rectum to the subperitoneal connective tissue, little can be done to make it heal beyond giving nourishing food, generous wine, and tonics, and place the patient in as favorable hygienic conditions as possible. She should, however, be watched, and when the cellulitis emerges from the pelvis an incision should be made at Petit's triangle at the crest of the ilium, between the obliquus externus abdominis and erector spinæ muscles. By dilating, draining, and irrigating the fistulous tract there is a fair chance of its closing. Peroxide of hydrogen, tincture of iodine, iodoform-glycerin are the substances most used for the injection.

§ 10. **Pruritus Ani.**—Pruritus ani is a condition similar to pruritus vulvæ. It is characterized by itching at and around the anus. This sensation increases at night, in a warm room, or at physical exertion. It may be continuous, but is oftener intermittent, with free intervals extending over days and weeks.

It may be *symptomatic* or *idiopathic*.

The gouty dyscrasia or general nervousness predisposes to it. It may be due to the irritation caused by lack of cleanliness, or by parasites,—the oxyuris vermicularis, or pin-worm; lice; or acarus scabiei, the itch-mite. Often the itching is produced by piles, erythema, or eczema of the perineum, or an acrid discharge from the genital canal or a fistula.

It is called idiopathic when no cause can be found, and must then be attributed to unusual irritability of the regionary nerves.

The itching may take such proportions that it becomes a serious disease. It tempts to scratching, which leads to eczema and intensifies the itching. It disturbs sleep, produces general nervous irritability, causes melancholia, and makes the patient unfit for work.

The *treatment* must, first of all, be directed against the cause. As a prophylactic, the anal region should be kept scrupulously clean by washing it daily with cold water. The different parasites should be killed by appropriate means (see PRURITUS VULVÆ, p. 128).

Inflammation of the surrounding skin should be subdued with vaseline, unguentine, unguentum diachyli, resinol, etc.

The idiopathic form may be relieved or cured by washing the anal region with carbolized water (1 to 2 per cent.) and smearing it with carbolized white vaseline of the same strength, cocaine ointment (10 per

cent.), or suppositories with morphine (gr. $\frac{1}{3}$ —2 centigrammes) administered at bedtime. Hypnotics may be given also by the mouth to secure sleep. Since the condition is often protracted, opiates should be used very cautiously.

Overdistention of the sphincter and touching the anus with Paquelin's cautery have also been recommended. The latter should be used very superficially in order to avoid producing a stricture. (See also PRURITUS VULVÆ.)

§ 11. **Fissure of the Anus.**—A fissure is a solution of continuity situated between the radiating folds of the anus. When the latter are spread open it appears as a long, narrow, red, and bleeding surface. It is from $\frac{1}{8}$ to $\frac{1}{4}$ inch wide and from $\frac{1}{2}$ to $\frac{3}{4}$ inch in length. It is quite superficial, but gives rise to great pain and spasm. The pain is sharp, cutting, and much increased during defecation, and the paroxysm lasts about a quarter of an hour after. The pain often irradiates to the lumbar region and down the thighs.

Fissure is often combined with piles. It is caused by constipation, the large hard fecal masses scraping off the epithelium of the anal opening and causing an infection of the wound. By a reflex action the sphincters contract, which makes the expulsion of feces so much more difficult and painful.

Although the affected part is so small, it produces great distress, and has even a bad influence on the general health. Dreading the pain accompanying defecation, the patient is apt to defer the action of the bowels, whereby not only the local condition becomes worse, but reabsorption takes place from the rectum, and effete substances accumulate in the blood.

The *diagnosis* is generally easy, the linear ulcer appearing as soon as the buttocks are held apart. When the patient strains, as at stool, it becomes visible in its whole length. If there is any difficulty in finding it, the local pain felt by the patient when the surgeon turns the finger in the anus helps to indicate its location. *Neuralgia of the anus* is also painful and comes in paroxysms, but these are independent of defecation, and there is no ulceration.

Treatment.—Small and fresh fissures may be healed by using a laxative, washing the anus with cold water, and inserting a little piece of absorbent cotton, soaked in a 4 per cent. solution of cocaine hydrochlorate, into the rectum, so that one-half of it remains outside. It is renewed three or four times a day. Ointments of iodoform or ichthyol (5 to 10 per cent.) are also useful. If these palliative remedies fail to

cure the disease, the patient should be anæsthetized and the sphincter overstretched with a bivalve dilator worked by a screw (Fig. 335) and with both thumbs. The latter are carried out to the sides until they

FIG. 335.

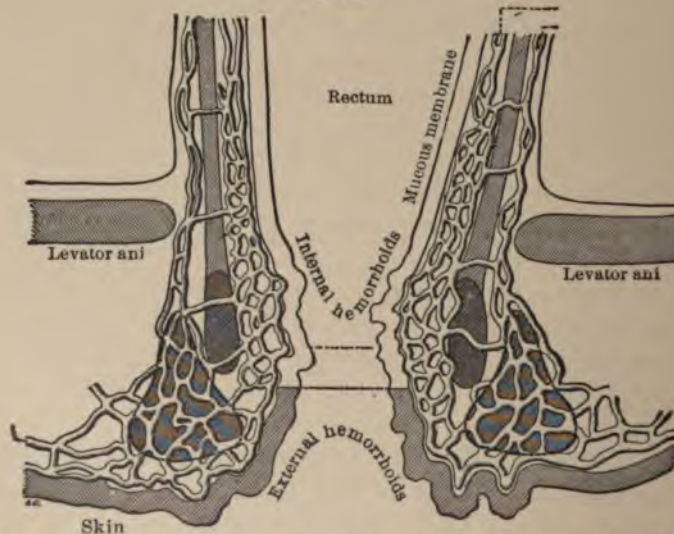


Branched metal anal dilator.

touch both tuberosities of the ischia at the same time. This simple operation, combined with some antiseptic wash, is an absolute cure, the fissure healing, while the muscle is paralyzed.

§ 12. Hemorrhoids, or Piles.—Hemorrhoids are varicose veins at the anus. They form one or more globular tumors, which, if situ-

FIG. 336.



Schematic representation of a longitudinal section through the anus, showing the relation of the swollen veins to the muscles.

ated below, *i.e.*, outside the sphincter, are called *external*, while those above the muscle are called *internal* (Fig. 336). They may appear only occasionally, especially at seasons of good cheer, and disappear

again without treatment within a week. But usually they are chronic formations which develop slowly and have come to stay. Even then there are periods of exacerbation, when they become large, tense, and painful, alternating with others of relaxation when the pain and swelling subside. By the repeated or constant swelling the connective tissue surrounding the vein becomes irritated, hypertrophic, and indurated, so that the tumors become hard and do only partially collapse on pressure. The tumors then become globular, more or less distinctly pedunculated, and three or four of them surround the anus. They are of dark-red, purple, or blue color, prone to bleed, and may ulcerate or become strangulated. They may be covered by mucous membrane alone or partially by the skin. The dilated vein may form a globular hollow, in which the blood may stagnate and coagulate. Old hemorrhoids may collapse and form little flat tags of skin and subcutaneous connective tissue, so-called *mariscæ*.

Hemorrhoids are more frequent in women than in men. Being varicose veins, they are caused by anything that impedes the free reflux of the blood from the anal region, such as diseases of the liver, heart, or kidneys; a retroflexioversion of the uterus; any kind of uterine, ovarian, or other abdominal tumor that presses on the vena porta; constipation; venereal excesses; and a sedentary life. Or they may be the result of overfeeding and high living or the abuse of drastic aperients. Gout and rheumatism predispose to their development.

Symptoms.—Hemorrhoidal patients complain of a sensation of fulness in the abdomen, flatulence, loss of appetite, shortness of breath, headache, vertigo, and buzzing in the ears—all conditions easily explained by the embarrassed circulation. They may be inconvenienced by itching, or suffer great pain, which is aggravated by walking or standing, and becomes intolerable when the tumor is being strangulated. The tumor may become sloughy, and inflammation extend to the connective tissue around the anus, or erysipelas may attack the surrounding skin.

A chief symptom from which the disease derives its name (*αἷμα*, blood, *ῥέω* I flow) is the bleeding. This loss of blood gives momentary relief, but if it is abundant and often repeated, it weakens the patient and makes her pale.

Diagnosis.—*Condylomas* are smaller and flatter and give the history of syphilis. *Venereal vegetations* are composed of small denticritic growths, and secrete a thin fluid of a peculiar, nauseous odor. *Polypi* are situated higher up, have a slender pedicle, are not sensitive to

touch, and as a rule there is only one. In *prolapsus* the whole circumference of the gut comes out and is not divided into several separate tumors. The early distinction from *cancer* is of great practical importance. Carcinoma forms one tumor implicating the whole circumference of the bowel, it is much harder, opposes much greater resistance to the passage of fæces, and causes more severe pain.

Treatment.—As a prophylactic, particular attention should be paid to obtaining regular daily movements without the use of drastic purgatives. Moderation in eating and drinking and proper exercise should be inculcated. During an attack great relief is afforded by pressing a large sponge soaked in hot water against the anus and replacing the tumors as soon as they collapse. They may be smeared two or three times daily with the officinal unguentum gallæ, to which may be added pulvis opii in the proportion of $\frac{1}{2}$ drachm (2 grammes) to the ounce (30 grammes). When these mild means do not suffice, each tumor may be injected with a few drops of

R Acidi carbolic,
Glycerini,
Aquæ dest., āā ʒi (4 grammes).

This makes them shrink, and a complete cure is sometimes effected in this way. The procedure is so little painful that it may be done in the office without anæsthesia; but since it is not quite free from danger, it is safest to take one tumor at a time and not inject more than three drops.

Another way is to inject a hypodermic syringe full of iodoform-glycerin (10 per cent.) in different places into the connective tissue outside the swollen veins.

There are two more strictly surgical methods in common use,—one is the ligature, the other the thermocauterization. For the ligature rubber-thread may be used, which is tightened around the base of each tumor. This is an effective and safe method that leads to a cure in a few days. Ligature may also be combined with excision, when the tumor after having been tied at its base with silk is cut off beyond the ligature. This has the advantage that there is left much less tissue to slough. Finally, the tumors may be compressed at their base between the branches of a clamp (Fig. 337) and cut off with the thermocautery-knife at dull heat. The clamp should be held at right angles to the axis of the rectum. This method does not leave any dead tissue and closes the vessels, but it causes considerably

more pain after the operation than the ligature and may produce a stricture. It is said that the pain can be prevented by making small incisions through the skin with scissors (Howard Lilienthal).

Whitehead's Operation.—A circular incision is made around the anus, the whole mucous membrane as far as it contains varicose veins is dissected free and cut off, and finally the edge of the healthy mucous membrane is sutured to the skin. This is the most radical operation for hemorrhoids, but, since it is bloody and tedious, it should not be performed on weak patients.

Before any of the operations the sphincter should be overstretched. Internal hemorrhoids are drawn outside with a tenaculum-forceps.

§ 13. *Neoplasms.*—A. POLYPI are globular, pedunculated tumors springing from the mucous membrane of the rectum, generally its

FIG. 337.



Smith's cautery-clamp.

posterior aspect. They may be hard and composed of fibrous connective tissue (Fig. 338) or soft and glandular (Fig. 339).

As a rule, there is only one polypus, or at most a few. It is generally situated from 1 to $1\frac{1}{2}$ inches above the anus. The pedicle may be short and thick or long and slender. The tumor is commonly small, and rarely attains the size of a hen's egg.

The presence of a small tumor in the rectum hardly gives rise to any symptom, but when it is larger defecation becomes difficult and painful. The pain may irradiate from the anus all over the pelvis. Most often there is a glairy or bloody discharge through the anus. The tumor may protrude from the bowel, or its pedicle may be torn and the tumor expelled. It is a benign growth, which does not affect the general health, except the loss of blood is great enough to cause anæmia, when headache, vertigo, or syncope may follow.

The *diagnosis* is not difficult. If the tumor projects from the anus it may be inspected. If it is concealed in the interior of the

bowel, it can be felt and often brought outside. At all events, it can be exposed with a speculum. *Hemorrhoids* are darker and surround the anus like beads. In *prolapse* the whole circumference of the gut protrudes, and in the centre is an opening leading to the intestinal canal. *Carcinoma* also surrounds the whole anus, is hard, very painful, secretes an offensive fluid, and soon undermines the constitution.

The *prognosis* is good.

The *treatment* consists in the removal of the tumor, which may be effected by surrounding the pedicle with an elastic ligature, or simply twisting and tearing it. If it is broad it is better to transfix it, cut

FIG. 338.



Fibrous polypus of rectum. (Esmarch.)

FIG. 339.



Glandular polypus of rectum. (Esmarch.)

the ligature into two halves, cross them and tie them, and then cut off the tumor.

B. *DERMOIDS* that develop in the ovaries or the pelvic connective tissue may rupture into the rectum.

C. *CYSTS* filled with a pultaceous mass, so-called *atheromas*, may form in the skin, spread in the ischiorectal connective tissue, and open into the rectum. They are generally situated between the anus and the coccyx.

In both kinds of cysts, dermoids and atheromas, the tumor should be extirpated and the opening in the rectum sutured.

D. *CARCINOMA*.—Carcinoma of the rectum may be *primary* or *secondary*, the latter being due to an extension of the disease from the

uterus. The primary variety is situated in the lowest portion of the gut, the secondary higher up. The primary may begin as an annular infiltration all around the lower end or in disseminated points, which later unite. There may be an exuberant growth of tissue, forming a cauliflower-like mass, or simply hard nodules which ulcerate and secrete a thin, highly-offensive fluid. The ulcer has a very hard, sharply-marked base. The affection may be limited to the anal region or extend over the whole rectum. It may be subperitoneal or enter the peritoneal cavity. It may implicate the septum between the rectum and the vagina. The growth encroaches on the lumen of the intestine, and may close it altogether. The pressure above the cancerous stricture may, like any other narrowing of the canal, give rise to ulcerations, the formation of fistulæ, and abscesses.

The true *cause* of cancer in this region is as little known as elsewhere, but mechanical injury by the passage of hard fæces has undoubtedly much to do with its production.

The *symptoms* are at first obscure, being limited to dyspepsia; but soon this is followed by characteristic ones. Constipation becomes more and more pronounced. The fæces become tape-shaped. They are often mixed with blood or pus, or dark and grumous like coffee-grounds. Defecation gives rise to severe, almost unbearable, pain. Even, independently of this act, the patient has a sensation of weight and burning and tenesmus, or suffers agonizing pain at the anus and lancinating all through the pelvis, the lumbar region, and the lower extremities. Sleep is disturbed or prevented by pain. The patient loses flesh; her skin takes an ashy, yellowish-gray color, and her strength declines. From time to time colliquative diarrhœa takes the place of constipation.

Diagnosis.—Only too often the condition is, by the patient or even her medical adviser, taken for *hemorrhoids*, but the diagnosis is not difficult if a physical examination is made. Then the finger meets with the constriction. The great hardness is characteristic. The examination is much more painful and the bleeding free. In cancer the tumor forms one hard, ring-shaped mass; in hemorrhoids there are several separate tumors, and they are much softer. The constipation is less pronounced and the fæces not tape-shaped. The penetrant odor is also characteristic for cancer. *Polypi* form one or more separate pedunculate tumors springing from a normal mucous membrane. A *cicatricial* stricture is much more limited in height, and does not give rise to so much hemorrhage, pain, and constitutional disturbance.

The *prognosis* is very grave. Even a radical operation may give relief only for a time. If an artificial anus must be made, the condition is disgusting, and the disease continues its ravages.

Treatment.—The first question that presents itself is whether the case is operable or not. An operation should be thought of only if the disease is so limited that the extirpation of the affected tissue can be done in the healthy. If there are metastases in other organs, it is absolutely contra-indicated. Likewise if the general condition is bad. In such circumstances the physician should direct his efforts against the pain and the loss of blood, and regulate the diet, which should be nourishing, but leave as little fecal residue as possible.

The use of rectal bougies can rarely be recommended, since their passage causes much pain and does not prevent the extension of the disease. Still, if the case is inoperable, the patient's strength low, and she is adverse to the establishment of an artificial anus, life is prolonged, and the condition made more tolerable by keeping the normal passage open.

The radical operation consists in the removal of the diseased portion of the rectum. The best method is that of Kraske (Figs. 340–343). The patient is laid on her left side. A somewhat curved incision is made from the right sacro-iliac articulation to a point a little to the left of the anus (Fig. 340). The coccyx and lower portion of the sacrum are laid bare and freed from their muscular connections. The coccyx is removed, and more or less of the lower part of the sacrum, the limit being below the third posterior sacral foramen (Fig. 341). The rectum is dissected free (Figs. 342, 343), cut transversely, and the upper part sutured to the skin at the end of the sacral bone. If the degeneration extends beyond the insertion of the peritoneum on the intestine, the serous membrane is incised, the gut pulled down, and then the parietal peritoneum sutured to the visceral before severing the intestine in order to prevent fecal matter from entering the peritoneal cavity. At last the gut is fastened to the skin at the lower end of the sacrum.

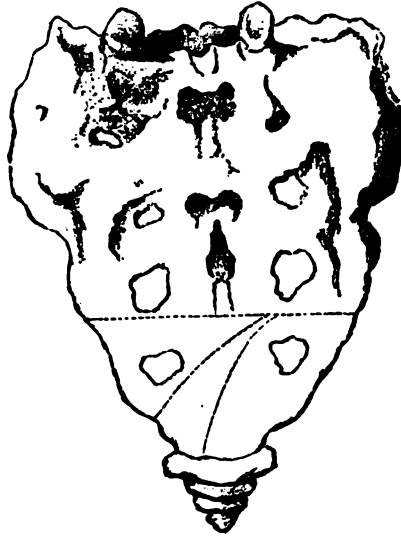
If this radical operation cannot be performed, an artificial anus should be made in the left iliac region. This is called for, if more than the lower 5 inches of the intestine is involved.

E. *Tuberculosis.*—The rectum is often the site of miliary tubercles and tuberculous ulcers. The infection is generally due to bacilli being swallowed by patients, the air passages of whom are attacked. It gives rise to profuse diarrhœa and sometimes to hemorrhage.

Treatment. The general treatment is the same as for tuberculosis

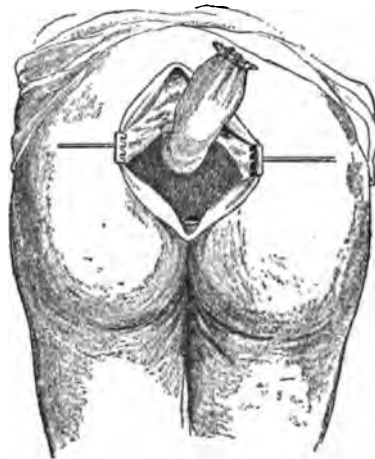
in other regions (see pp. 138, 403). The ulcers should be curetted and dusted with iodoform. Iodomuth or xeroform, gr. x-xv (60 cen-

FIG. 341.



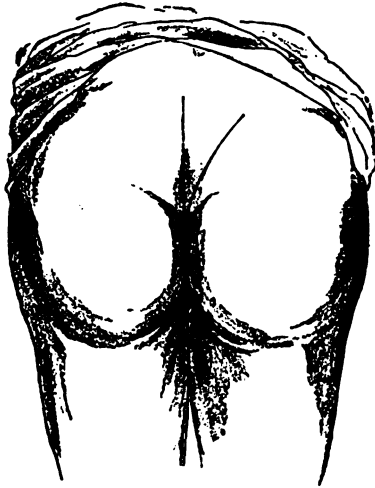
Kraske's operation. Second step: resection of the lower portion of sacrum.

FIG. 343.



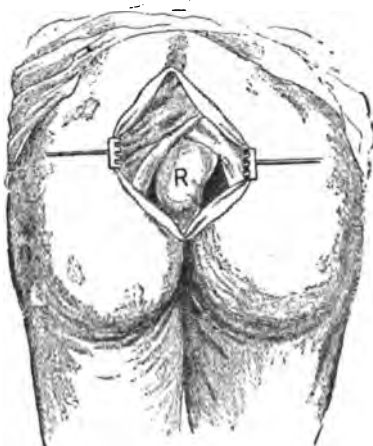
Kraske's operation. Fourth step: rectum dissected free.

FIG. 340.



Kraske's operation for cancer of the rectum. First step: incision.

FIG. 342.



Kraske's operation. Third step: exposure of rectum.

tigrammes to 1 gramme), with subnitrate of bismuth, ʒi-ii (4 to 8 grammes) are given in enema 3 or 4 times a day.



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